

Rocky Flats Independent Verification

Sampling and Survey Report

**Evaluation and Interpretation of the Residual
Radiological Surface Contamination Sampling Results**

Building 779, Main Building

January 2000



Work Performed Under DOE Contract No. DE-AC13-96GJ87335

ADMIN RECORD

B779-A-000142

1/480

Rocky Flats Environmental Technology Site
Building Decontamination & Decommissioning Independent Verification Project

**Independent Verification Sampling and Survey Report for
Building 779 Cluster
Main Building**

January 2000

Prepared for
U.S. Department of Energy
Rocky Flats Operations Office
Grand Junction Office

Prepared by
MACTEC Environmental Restoration Services, LLC
Grand Junction, Colorado

Project Number RFL-131-0001-00-000
Document Number Z00006AA

Work Performed Under DOE Contract No. DE-AC13-96GJ87335
Task Order No. MAC00-13

Signature Page

Prepared by _____ Date _____
Art Samiljan
Staff Health Physicist

Approved by _____ Date _____
Steve Rima
Project, Technical Manager

Approved for _____ Date _____
Release by Michael Butherus
Manager, Major Projects

Contents

Acronyms and Abbreviations	ix
1.0 Introduction	1-1
1.1 Background	1-1
1.2 Building 779 History	1-2
1.3 Current Condition of Building 779, Main Building	1-2
1.4 Overview of the Assessment and Independent Verification Process	1-2
2.0 Field Investigation	2-1
2.1 Mobilization	2-1
2.2 Field Selection of Survey Units for Independent Verification	2-1
2.3 Field Identification of Sample Locations	2-3
2.4 Sampling Equipment and Procedures	2-6
2.4.1 Radiological Instrumentation	2-6
2.4.2 Sampling	2-7
2.4.2.1 Smear Sampling	2-7
2.4.2.2 Surface-Media Sampling	2-7
2.4.3 Laboratory Measurements	2-8
2.4.4 Field Measurements	2-9
2.4.4.1 Background Determination	2-9
2.4.4.2 Direct Static Surface Radioactivity Measurements	2-9
3.0 Sampling and Survey Results	3-1
3.1 Direct Static Field Measurements	3-1
3.1.1 Background Measurements	3-1
3.1.1.1 Background Adjustment	3-4
3.1.2 Field Measurement Data	3-6
3.1.2.1 Post-Surface Media Sampling Measurements	3-9
3.2 Laboratory Measurements	3-12
3.2.1 Smear Samples	3-13
3.2.2 Surface Media Samples	3-15
4.0 Analysis of Sample Plan Results for Compliance	4-1
4.1 Survey and Sampling Results Compared to the DCGLs	4-2
4.1.1 Direct Static Surface Measurements	4-2
4.1.2 Smear Samples for Removable Surface Contamination	4-3
4.1.3 Surface Media Samples	4-4
4.2 Summary of Field Sampling Data	4-5
5.0 Graphic Presentations of the Survey and Sampling Results	5-1
5.1 Posting Plots—Spatial Contamination Distribution Graphics	5-1
5.2 Histograms—Concentration Distribution Graphics	5-1
5.3 High-Low Graphs—Data Variability Graphics	5-7
6.0 Quality Control Sampling Results and Analysis	6-1
6.1 Stage I—Independent Quality Control of the Contractor's Sampling	6-1
6.1.1 Smear Samples	6-1
6.1.2 Surface Media Samples	6-4
6.1.3 Direct Surface Emission Measurements	6-6
6.2 Stage II—Quality Control of the Independent Verification Sampling	6-6
6.2.1 Smear Samples	6-6
6.2.2 Surface Media Samples	6-9
6.2.3 Direct Static Measurements	6-11

6.2.3.1 Replicate Field Measurements6-11

6.2.3.2 Instrument Response Check Data.....6-13

7.0 Data Quality Analysis7-1

7.1 Detection Limit Adequacy7-1

7.2 Sample Size and Statistical Power.....7-2

7.3 Measurement Uncertainty and Data Quality Indicators7-5

7.4 Overall Quality Assurance and Quality Control.....7-6

8.0 Summary and Conclusions8-1

8.1 Independent Verification Sampling and Survey8-1

8.2 Independent Review of the Contractor’s Final Status Survey Report and
Conclusions8-1

9.0 References9-1

Figures

Figure 2-1. Sampling Grid—Survey Unit 779-35 2-4

Figure 2-2. Selected Sample Locations—Survey Unit 729-35 2-5

Figure 2-3. Sample Location Identifier 2-6

Figure 2-4. Direct Static Surface Contamination Measurement Configuration..... 2-6

Figure 2-5. Photo of Rotary Impact Drill and Bit 2-7

Figure 2-6. Surface Media Sample Collection 2-8

Figure 3-1. Data Evaluation Statistics—“Free Air” Instrument Background 3-3

Figure 3-2. Data Evaluation Statistics—Direct Static Surface Measurements 3-8

Figure 3-3. Data Evaluation Statistics—Direct Static Surface Measurements 3-11

Figure 3-4. Data Evaluation Statistics—Uranium Series Activity, Surface Media Samples... 3-18

Figure 3-5. Data Evaluation Statistics—Transuranic Activity, Surface Media Samples..... 3-19

Figure 5-1. Posting Plot—Direct Static Surface Contamination Measurements 5-2

Figure 5-2. Posting Plot—Surface Media Samples, Transuranic Activity 5-3

Figure 5-3. Posting Plot—Surface Media Samples, Uranium Series Activity..... 5-4

Figure 5-4. Histogram—Instrument Background Measurements 5-5

Figure 5-5. Histogram—Direct Static Surface Contamination Measurements 5-5

Figure 5-6. Histogram—Post-Surface Media Sampling Direct Static Surface Measurements.. 5-6

Figure 5-7. Histogram—Surface Media Samples, Transuranic Activity 5-6

Figure 5-8. Histogram—Surface Media Samples, Uranium Series Activity 5-7

Figure 5-9. High-Low Graphs—Direct Static Surface Measurements 5-8

Figure 5-10. High-Low Graphs—Surface Media Samples, Transuranic Activity..... 5-8

Figure 5-11. High-Low Graphs—Surface Media Samples, Uranium Series Activity..... 5-9

Figure 6-1. Comparison of Duplicate Alpha Isotopic Sample Analysis Results 6-11

Figure 6-2. Comparison Between Replicate Direct Static Measurements 6-13

Figure 6-3. Instrument Response Check Control Chart 6-14

Figure 6-4. Instrument Response Check Control Chart 6-15

Figure 7-1. Retrospective Power of the Sign Test—Direct Static Surface Measurements 7-3

Figure 7-2. Retrospective Power of the Sign Test—Smear Sample Measurements..... 7-3

Figure 7-3. Retrospective Power of the Sign Test—Surface Media Samples/Transuranic
Activity 7-4

Figure 7-4. Retrospective Power of the Sign Test—Surface Media Samples/Uranium Series
Activity 7-4

5

Tables

Table 2-1. Survey Units Identified for Building 779	2-2
Table 2-2. Smear Sample Analytical Method	2-8
Table 2-3. Surface Media Sample Analytical Method	2-9
Table 3-1. Direct Static Measurement Background Data, Main Building, Survey Unit 779-35	3-2
Table 3-2. Background Data Summary Statistics, Main Building, Survey Unit 779-35	3-4
Table 3-3. Static Surface Contamination Measurement MDA Parameters	3-5
Table 3-4. Direct Static Surface Contamination Measurements, Main Building, Survey Unit 779-35	3-7
Table 3-5. Summary Statistics, Direct Static Measurements, Main Building, Survey Unit 779-35	3-9
Table 3-6. Post-Surface Media Sample Direct Static Surface Measurements	3-10
Table 3-7. Summary Statistics, Post-Surface Media Sampling Direct Static Measurements, Main Building, Survey Unit 779-35.....	3-10
Table 3-8. Comparison of Direct Static Measurement Data Sets Summary Statistics	3-12
Table 3-9. Direct Static Measurement Data Sets, Pre- and Post-Surface Media Sampling	3-13
Table 3-10. Smear Sample Identification Crosswalk.....	3-14
Table 3-11. Summary of Analytical Report Data for Smears	3-14
Table 3-12. Surface Media Sample Data, Main Building, Survey Unit 779-35—Alpha Isotopic Analysis.....	3-16
Table 3-13. Summary Statistics, Surface Media Samples	3-17
Table 4-1. Comparison of Direct Static Survey Measurements to Applicable DCGLs.....	4-2
Table 4-2. Comparison of Background Adjusted Direct Static Survey Results to Applicable DCGLs	4-3
Table 4-3. Comparison of Smear Sample Results to Applicable DCGL _w	4-4
Table 4-4. Comparison of Surface Media Sample Results to Applicable DCGLs	4-4
Table 6-1. Results of the Contractor's Assay of QC Smear Samples Provided by the IVC.....	6-3
Table 6-2. Results of the Contractor's Assay of QC Surface Media Samples Provided by the IVC.....	6-4
Table 6-3. Comparison of Response of Instruments used to Make Direct Surface Measurements	6-6
Table 6-4. Results of the GJO Analytical Laboratory Assay of QC Smear Samples Provided by the IVC.....	6-8
Table 6-5. Results of the IV Laboratory Internal QC Measurements for Smear Samples.....	6-9
Table 6-6. Results of the IV Laboratory Internal Blank QC Measurements for Surface Media Samples	6-9
Table 6-7. Results of the IV Laboratory Internal LCS QC Measurements for Surface Media Samples	6-10
Table 6-8. Results of the IV Laboratory Internal Duplicate QC Measurements for Surface Media Samples.....	6-10
Table 6-9. Results of Replicate Direct Static Surface QC Measurements	6-12
Table 7-1. Adequacy of Independent Verification Measurement Detection Limits	7-1
Table 7-2. Target Data Quality Indicators and Findings.....	7-7
Table 8-1. Comparison of Building 779 DCGLs to Observed Compliance Parameters.....	8-1

Appendices

Appendix A. Random Selection DataA-1
Appendix B. Manufacturer's CertificationB-1
Appendix C. Analytical Laboratory ReportsC-1
Appendix D. Background Sample Data.....D-1
Appendix E. Background Data SetE-1
Appendix F. Duplicate Sample DataF-1
Appendix G. Instrument Calibration DataG-1
Appendix H. Raw Data.....H-1
Appendix I. Sign Test I-1

Acronyms and Abbreviations

Am	americium
Am-241	americium-241
CCV	continuing calibration verification
CDPHE	Colorado Department of Public Health and Environment
CLP	Contract Laboratory Program
cpm	counts per minute
cm ²	square centimeter(s)
CV	coefficient of variation
D&D	decontamination and decommissioning
DCGL	derived concentration guideline level
DCGL _{EMC}	derived concentration guideline level-elevated measurement comparison
DCGL _{LW}	derived concentration guideline level-average concentration
DOE	U.S. Department of Energy
dpm	disintegration(s) per minute
DQA	data quality analysis
DQI	data quality indicator
DQO	data quality objective
EPA	U.S. Environmental Protection Agency
ft	feet
GJO	Grand Junction Office
IV	independent verification
IVC	independent verification contractor
IVP	independent verification program
L _c	critical detection level
LCS	laboratory control sample
LLC	limited liability corporation
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MDA	minimum detectable activity
MDA _{GROSS}	gross minimum detectable activity
mm	millimeter(s)
m ²	square meter(s)
NIST	National Institute of Standards and Technology
PB	preparation blank
pCi	picoCurie(s)
Pu	plutonium
Pu-238	plutonium-238
Pu-239	plutonium-239
Pu-240	plutonium-240
QA	quality assurance
QC	quality control
r ²	coefficient of determination
RFETS	Rocky Flats Environmental Technology Site
RFFO	Rocky Flats Field Office
RMRS	Rocky Mountain Remediation Services
SAP	Sampling and Analysis Plan

Sr-90 strontium-90
U uranium
UCL₉₅ 95 percent upper confidence limit

9

1.0 Introduction

1.1 Background

This sampling and survey report evaluates the final status survey data collected in Building 779, Main Building, both by the Rocky Flats Environmental Technology Site's (RFETS) Contractors (Kaiser-Hill, Rocky Mountain Remediation Services, L.L.C., and their subcontractors, hereafter referred to as the Contractor) and by MACTEC-ERS, the independent verification contractor (IVC). Data collected by the IVC is designed to independently assess and verify the RFETS' compliance with the approved derived concentration guideline levels (DCGLs) established for the buildings in the 779 Cluster. Data collected by the Contractor has been reviewed by the IVC and compared with the independent verification data collected by the IVC.

The sampling and survey data collected has been compared with the approved surface contamination concentration benchmark values known as DCGLs. The RFETS DCGLs for surface contamination concentration are specified in the Contractor's *Closeout Radiological Survey Plan for the 779 Cluster* (RMRS 1999a). The independent verification DCGLs are specified in the IVC's *Independent Verification Sampling and Analysis Plan for Building 779 Cluster* (IV SAP) (DOE 1999a).

Samples collected and surveys performed to obtain independent verification and corroboration of the RFETS sampling and survey results were collected in accordance with the U.S. Environmental Protection Agency (EPA), Colorado Department of Public Health and Environment (CDPHE), and U.S. Department of Energy (DOE) approved *Independent Verification Sampling and Analysis Plan for Building 779 Cluster* (DOE 1999a). The data is evaluated herein principally on the *Multi-Agency Radiation Survey and Site Investigation Manual* (MARSSIM) data quality assessment methods, conventional guidance from EPA, and accepted practice and methods used in radiological site assessment and characterization. Principal guidance documents include:

- *Multi-Agency Radiation Survey and Site Investigation Manual* (EPA 1997)
- *Data Quality Objectives Process for Superfund* (EPA 1993)
- *Guidance for Data Quality Assessment—Practical Methods for Data Analysis* (EPA 1998)
- *Manual for Conducting Radiological Surveys in Support of License Termination* (NRC 1992)
- *A Nonparametric Statistical Methodology for the Design and Analysis of Final Status Decommissioning Surveys* (NRC 1995)

A common theme in these guidance sources is the use of a seven-step data quality objective (DQO) activity as the foundation for the sampling and analysis plan (SAP) development and subsequent data evaluation.

Following this introductory background is a discussion of the Building 779 history and an overview of the assessment and independent verification process used. Section 2 describes the field methods and procedures used to collect data. Section 3 presents the sampling results and

summary statistics for each subset of data. It also describes the data reduction process used and statistical comparisons of the data subsets and their significance. Section 4 presents the sampling results in the context of compliance with the benchmark values while Section 5 presents the survey and sampling results in a graphic format. Evaluation of the Contractor's Final Status Radiological Survey, computations, and conclusions are presented in Section 6. The IVC collected data are compared to their respective DQOs in what is termed the Data Quality Analysis in Section 7. Section 8 summarizes the data quality analysis, provides objective assessment of the concentrations of residual contamination found in the building, and offers conclusions and recommendations for disposition of the building. Appendices are included to provide additional detail where appropriate.

The risk manager and decision maker for this project is DOE-Rocky Flats Field Office (DOE-RFFO).

1.2 Building 779 History

The Building 779 Cluster is located on DOE's Rocky Flats site near Golden, Colorado. The site is a former nuclear weapons production facility. The various process facilities and laboratories were grouped together with their various support buildings and structures and identified as "clusters," with the building number of the principal building as the cluster name (e.g., the Building 779 Cluster). The 779 Cluster was primarily used for research and development activities and supported a number of various operations as part of the research and development mission including: 1) process chemistry technology, 2) physical metallurgy, 3) machining and gauging, 4) joining technology, and 5) hydriding operations. No processes or operations are now active.

The Main Building is a two-story structure that was used as laboratories and support facilities for nuclear weapons research and development. The utility rooms (rooms 127 and 142) and the loading dock are single-level structures that are connected to the north and east sides of Building 779. The exterior walls of the main building are cinder block, and concrete. The exterior walls of the loading dock are galvanized steel, cinder block, and concrete.

1.3 Current Condition of Building 779, Main Building

The Main Building underwent a decontamination and decommissioning (D&D) process to ready it for final status radiological survey. In the D&D process, the building was stripped of utility services, and equipment and all penetrations were removed or cut flush with the walls. Numerous floor, walls, and ceiling surfaces were hydrolased or scabbled to remove paint. The Main Building was subdivided into 17 interior survey units. The IVC randomly selected one (779-35) of the 17 units as part of the overall Building 779 independent verification. At the request of the Contractors, the IVC has prepared this stand-alone report for the Main Building.

1.4 Overview of the Assessment and Independent Verification Process

The approach used to independently determine whether the Main Building met the mean, or average, benchmark release criteria (derived concentration guideline level-average concentration [DCGL_w]) followed the MARSSIM method. Five of 41 survey units identified in Building 779 were selected for actual measurement by the IVC. In this case, survey unit 779-35 (Main

Building) was one of the five selected for independent verification, thus meeting the contractual requirement to assess 5 to 10 percent of the Contractor's results. The IVC used oversight of the Contractor's scanning surveys and a critical review of the data collected by the Contractor to independently determine compliance with the maximum concentration benchmark release criteria (derived concentration guideline level-elevated measurement comparison [DCGLE_{EMC}]).

The first step in the process to independently assess the Contractor's basis for decision on the disposition of the Main Building was to review the Contractor's *Closeout Radiological Survey Plan For The 779 Cluster* (RMRS 1999a) and associated D&D planning documents. All comments and issues raised by the IVC were reported to DOE-RFFO and were addressed by the RFETS Contractor and implemented in the final status survey plan, as necessary.

The Contractor's SAP establishes the criteria which, when met, represent acceptable levels of risk from exposure to residual contamination which might be present in the building. DOE-RFFO, EPA, and CDPHE agreed upon surface contamination concentration criteria below which further remedial action would not be warranted. These criteria, or DCGLs, serve as the benchmarks against which the building surfaces were to be measured. The Contractor's DCGLs are:

- The mean removable alpha surface contamination concentration in the selected survey unit(s) is below 20 disintegrations per minute (dpm)/100 square centimeters (cm²).
- The mean total alpha surface contamination concentration attributable to transuranic radioactivity as measured by direct surface emission in the selected survey unit(s) is below 100 dpm/100 cm² (averaged over 1 square meter [m²]).
- The mean total alpha surface contamination concentration attributable to uranium series radioactivity¹ as measured by direct surface emission in the selected survey unit(s) is below 1,000 dpm/100 cm² (averaged over 1 m²).
- The maximum total alpha surface contamination concentration attributable to transuranic radioactivity as measured by direct surface emission in the selected survey unit(s) is below 300 dpm/100 cm².
- The maximum total alpha surface contamination concentration attributable to uranium series radioactivity as measured by direct surface emission in the selected survey unit(s) is below 5,000 dpm/100 cm².
- The mean total alpha contamination concentration attributable to transuranic radioactivity on and beneath a surface with a surface coating as measured by collection and analysis of a surface media sample in the selected survey unit(s) is below 100 dpm/100 cm².
- The mean total alpha contamination concentration attributable to uranium series radioactivity on and beneath a surface with a surface coating as measured by collection and analysis of a surface media sample in the selected survey unit(s) is below 1,000 dpm/100 cm².

¹In cases where isotopic composition is not determined, the SAP requires the application of the more restrictive limits associated with the transuranic series radionuclides.

After reviewing the Contractor's SAP, an IV SAP was constructed. The IV SAP was developed in consultation with DOE-RFFO, EPA, and CDPHE. It was designed to detect and measure the concentration of the radioactive contamination remaining in survey units selected for independent verification such that statistically appropriate analyses could be used to determine whether the results obtained by the Contractor in the same survey unit could be verified or corroborated by the IVC. The IV SAP alone does not collect enough data to make the required decision for the entire building but provides sufficient data for critical comparison with the Contractor's conclusion in a single survey unit. In the case of the Main Building, the IVC performed surveys and sampled one of the 17 interior survey units (779-35) identified by the Contractor.

The next step was to observe and evaluate the Contractor's implementation of the final status survey against the criteria established in the SAP. The IVC spent several days on site observing the Contractor's sampling and survey methods and reviewing analytical processes.

The fourth element of the independent verification process was to provide blind matrix samples to the Contractor for inclusion in their sample batches from Building 779. The blind samples included both blanks and spikes of smear filter paper matrices and surface media matrices. It is important to note that it is not critical to the sampling objective to introduce Stage-I quality control (QC) samples to a particular batch of the Contractor's samples or even while they are sampling a particular building or survey unit being considered for independent verification.

Finally, and with the approved IV SAP, the sampling plan was executed. The IVC collected samples and performed measurements in the selected survey unit in order to corroborate the results obtained by the Contractor. The measurements and samples were obtained in accordance with the *Independent Verification Sampling and Analysis Plan for Building 779 Cluster* (DOE 1999a).

The field data was reviewed in the field with representatives from DOE and the Contractor. The EPA and CDPHE have been apprized of the results of independent verification field data collected. Field data was recorded both on paper (Appendix D) and electronically (Appendix H). Following data collection, the data was verified and reduced so that the appropriate comparisons and analyses could be conducted. During data reduction it was discovered that the instrument's internal clock was not turned back to reflect the recent change from daylight savings time, thus the paper and electronic recorded times differ by 1 hour. The presentation of the results of the field sampling are detailed in this report along with the IVC's recommendations and verification of the Main Building final status survey results.

2.0 Field Investigation

2.1 Mobilization

Prior to mobilizing the independent verification sampling team at the site, each member of the team was provided with a copy of the IV SAP and was trained on the field sampling equipment and procedures to be used. The Contractor made detailed measurements of the building and supplied a simple architectural drawing of the IV selected survey unit in the Main Building (779-35) to be used in laying out the sampling grids and sample locations.

Mobilization to the field began the week of November 22, 1999. The sampling team personnel had completed all required RFETS training necessary to support the sampling and survey work during a previous visit to RFETS. Equipment was staged and final details were arranged.

The radiation survey detectors selected for this application were gas-filled, proportional counters made by Eberline; model HP-100. Gas-filled detectors are subject to response and calibration variation with changes in altitude. Consequently, the HP-100 probes were field calibrated on site at the RFETS altitude and using RFETS supplied counting gas. The instrument and probe package was response checked and verified to be in working order and within the parameters established in the SAP. The surface media-sampling tool was tested, and test measurements were made confirming the suitability of the measurement protocol. A walk-through of the building was made to assess the condition of the building, to identify any intrinsic safety issues, and to compare the building structure and features with the assumptions made and procedures outlined in the SAP. It was concluded that the assumptions used to develop the SAP and its associated procedures were consistent with the conditions existing in the building and that the procedures developed for characterizing the contaminant concentrations in the building accounted for these conditions.

2.2 Field Selection of Survey Units for Independent Verification

The first step in the sample allocation strategy was to select from among the 41 survey units available in Building 779 those survey units to be sampled and surveyed by the IVC. The random selection process assigned greater weighting or priority to survey units with a classification indicating greater potential to exceed the allowable radiological concentration. Table 2-1 lists the 41 survey units identified by the Contractor for Building 779 (RMRS 1999b). A simple, commercially available, spreadsheet program with a random number generation feature was used to randomly select the survey units to be independently verified. Appendix A contains a printout of the survey units selected by the computer generated random number method. Survey unit 779-35, Main Building, that included rooms 222 and 222A, was one of five units selected for Building 779.

Table 2-1. Survey Units Identified for Building 779

Survey Unit Description	Survey Unit #	Survey Classification	Weight Factor
Rooms 170/172 Floor and Lower Walls (including Mezzanine above Room 172)	779-01	Class 1	6
Room 171 Vaults	779-02	Class 1	6
Rooms 171/172 Upper Walls and Ceilings	779-03	Class 2	2
Stairs between Rooms 171 and 272, Rooms 270/272, and the Room 170 Dumbwaiter	779-04	Class 2	2
Exterior South/West Walls and Roof	779-05	Class 2	2
Exterior West Wall outside of Room 142, and Roof	779-06	Class 2	2
Exterior Annex A West/North Wall and Roof	779-07	Class 2	2
Dock Walls and Roof	779-08	Class 2	2
Exterior Walls and Roof of Admin Building and Duct Tower	779-09	Class 2	2
2 nd Floor Admin Building—Rooms 201 through 214	779-15	Class 3	1
Floor in Room 208	779-16	Class 1	6
1 st Floor Admin Building—Rooms 105 through 113	779-17	Class 3	1
Rooms 100, 101, 101A, 104, 116, 116A, 116B, 117	779-18	Class 3	1
Dock and Ramp	779-19	Class 3	1
Rooms 114, 115, 115A, Exhaust Duct Tower	779-20	Class 2	2
Rooms 143, 144, 145, 146, 147, 148, 151	779-21	Class 1	6
Room 150	779-22	Class 1	6
Room 152	779-23	Class 1	6
Rooms 154, 156	779-24	Class 1	6
Rooms 160, 160A	779-25	Class 1	6
Rooms 153, 153A, 153B, 155	779-26	Class 1	6
Rooms 157, 159	779-27	Class 1	6
Rooms 161, 163, 163A, 167, 167A,	779-28	Class 2	2
Rooms 162, 164, 165, 166	779-29	Class 2	2
Hallway to Annex A, Bridge to B777	779-30	Class 2	2
Room 217	779-32	Class 1	6
Rooms 219, 221, 221A, 221B, 221C, 223, 225, 229, 230, 231, 232, 233, 235, 271, 173, 274, 275, 277	779-33	Class 2	2
Rooms 215, 218, 220, 224	779-34	Class 1	6
Rooms 222, 222A	779-35	Class 1	6
Rooms 216, 226	779-36	Class 1	6
Room 228	779-37	Class 1	6
Rooms 234, 234A, 234B	779-38	Class 1	6
Rooms 103, 103A, 103B, 118, 120, 121, 121A, 121B, 173	779-39	Class 2	2
Rooms 122, 123, 126, 127	779-40	Class 2	2
Rooms 142, 142 Mezzanine	779-41	Class 2	2
Rooms 119, 124, 125, 128, 129, 132, 134, 135, 136, 138	779-42	Class 2	2
Room 001 and Pits	779-43	Class 1	6
Rooms 130, 131, 133	779-44	Class 1	6
Room 137	779-45	Class 1	6
Rooms 139, 140, 140A, 140B	779-46	Class 1	6
Rooms 141, 141A, 141B, 141C	779-47	Class 1	6

By assigning weighting factors to the survey units based on radiological classification, the independent verification survey will preferably select survey units which have a higher probability of exceeding the applicable DCGLs. Class 1 survey units (the most likely to be contaminated) are three times more likely to be selected than Class 2 units and six times more likely than Class 3 units.

2.3 Field Identification of Sample Locations

Once the survey unit to be verified had been selected, the proposed location of each measurement and sample was laid out using the sample allocation protocol specified in the SAP. A drawing of the survey unit was created with the walls and ceiling "unfolded" and set flat to assist the process of spatial distribution and sample location recording. The survey unit was then divided by a 2-meter sampling grid superimposed over the surface of the survey unit. Figure 2-1 shows the sample grid layout for survey unit 779-35.

The selection and distribution of sampling locations within the survey unit was made using the protocol approved in the SAP including:

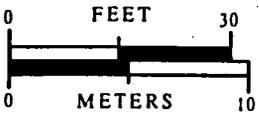
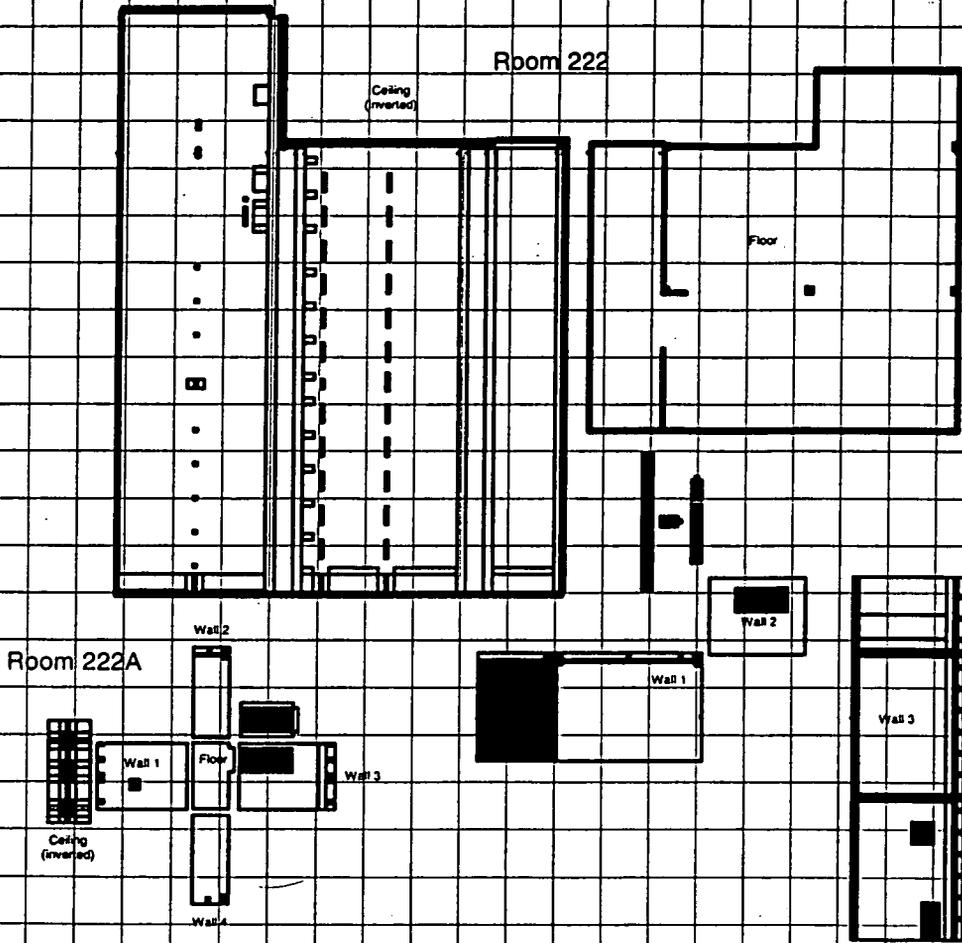
- Random selection of the sampling starting point within the selected survey unit(s) (Appendix A),
- Systematic distribution of sample locations within the selected survey unit(s) to ensure representative spatial coverage of the survey unit, and
- Personnel safety during the execution of the sampling plan.

Drawings of each surface within the survey unit with the sampling grid and actual sample locations as determined in the field are shown on Figure 2-2. After the sample locations were allocated, an inspection of the survey unit was conducted to ensure that each sample location selected could be accessed and sampled safely. Three sample locations were relocated in accordance with the sample relocation protocol outlined in the SAP due to inaccessibility issues. Those samples relocated are annotated on the drawings in Figure 2-2.

Sample locations were next laid out on the building surfaces within the survey unit. Each sample location was measured out and marked on the surface with a permanent marker. Unique alphanumeric bar codes (Figure 2-3) were affixed to the surface adjacent to the selected sample location. A duplicate bar code was affixed to the field data sheet and the bar code number was recorded on a copy of the survey unit drawings. It should be noted that all sample locations were selected without prior knowledge of contaminant concentrations in the area and before radiological survey instruments were employed. In this way, sample locations were not biased.

INDEPENDENT VERIFICATION FOR THE BUILDING 779 CLUSTER
SURVEY SURVEY UNIT SAMPLE PLAN
Building: 779 Survey Unit: 779-35 Number of Sample Locations: 29 Grid Size: 2m x 2m
Classification: 1 Survey Unit Description: B779 Main Building, Room 222 and 222A

SURVEY UNIT 779-35 MAP 1 OF 1



Each intersect point of the grid within the frame of the survey unit is a potential sample location

Figure 2-1. Sampling Grid—Survey Unit 779-35

17

INDEPENDENT VERIFICATION FOR THE BUILDING 779 CLUSTER
SURVEY SURVEY UNIT SAMPLE PLAN
Building: 779 Survey Unit: 779-35 Number of Sample Locations: 29 Grid Size: 2m x 2m
Classification: 1 Survey Unit Description: B779 Main Building, Room 222 and 222A

SURVEY UNIT 779-35 MAP 1 OF 1

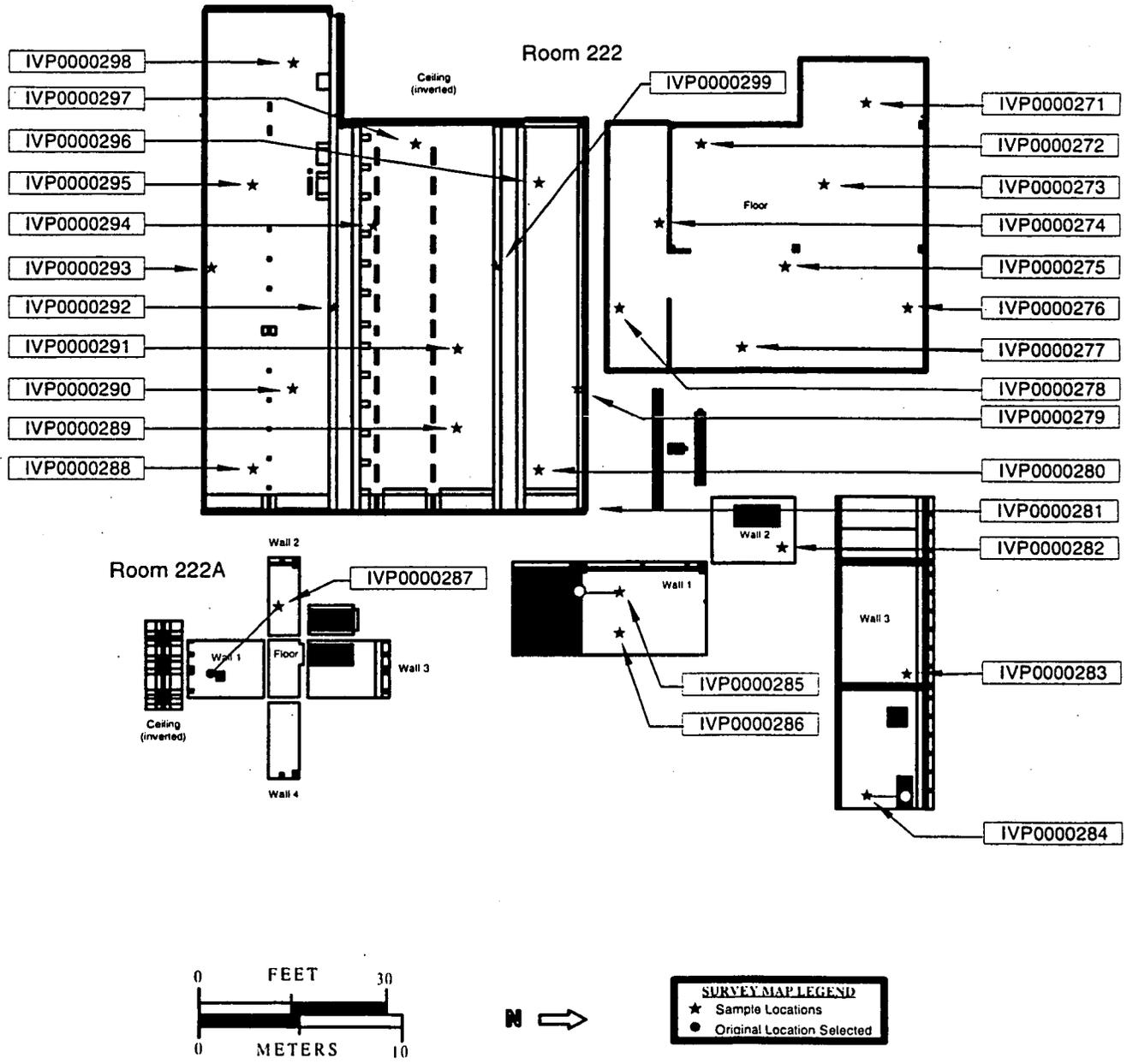


Figure 2-2. Selected Sample Locations—Survey Unit 729-35

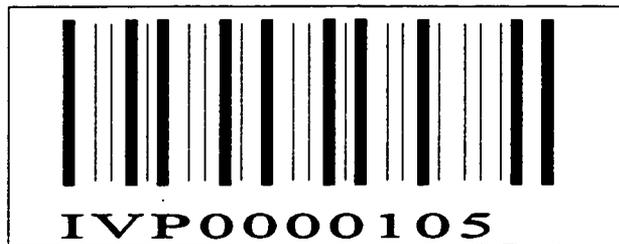


Figure 2-3. Sample Location Identifier

2.4 Sampling Equipment and Procedures

2.4.1 Radiological Instrumentation

The field measurement instrument used for measuring surface deposited radiological contamination was the Eberline, E-600 Smart Portable Multi-purpose Radiation Survey Instrument with a modified Eberline HP-100 gas proportional detector probe. The detector was fitted with an Eberline "Smart Pack" to convert the conventional detector to be compatible with the microprocessor based E-600 and to electronically store the probe's calibration data. The probe's alpha channel was calibrated to a plutonium-239 (Pu-239) National Institute of Standards and Technology (NIST) traceable calibration source. The calibration certificate for the source is provided in Appendix B and the calibration data sheets for the instruments are provided in Appendix G. Figure 2-4 shows the configuration used to measure the alpha surface emission activity on the surfaces in the survey unit. The direct measurement data was collected in accordance with the procedure outlined in the SAP.

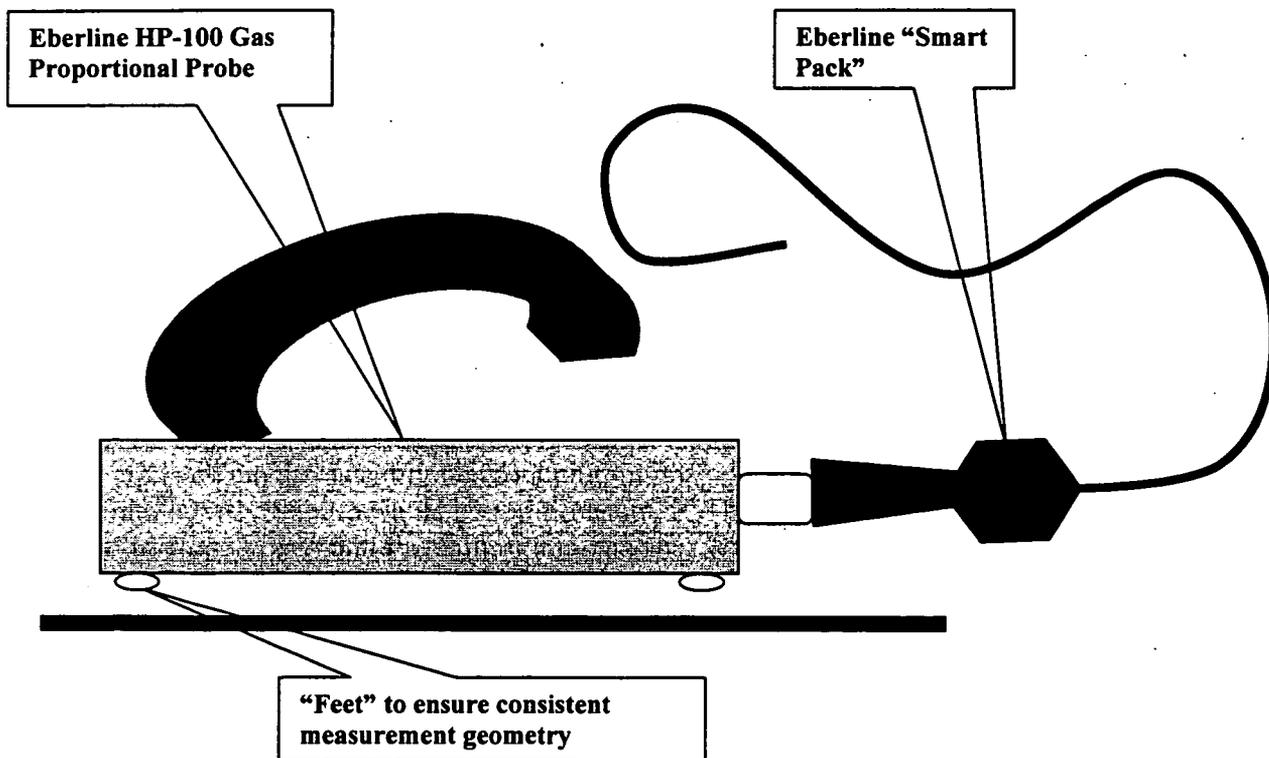


Figure 2-4. Direct Static Surface Contamination Measurement Configuration

2.4.2 Sampling

2.4.2.1 Smear Sampling

Smears were used to wipe the surfaces in order to measure the potential for removable radioactivity on the survey unit surfaces. The IVC chose to use 47 millimeter (mm) disc smears made of a duck cloth material rather than the typical paper or cellulose fiber filters commonly used since many of the surfaces requiring measurement are very rough. The duck cloth smears are very durable and will pick-up loose contaminants from even very rough or abrasive surfaces without disintegrating. The smear samples were collected after the direct static surface measurements were obtained. The technician wiped the surface within the 100 cm² sample area applying moderate pressure. Each smear was placed individually into a glassine envelope to prevent cross contamination and static charge induced migration of contaminants. Each glassine envelope containing a smear sample was then over-packed in a small sealable plastic bag and then in a manila sample envelope. The envelope was then marked with a bar code label linking it to the sample location from which it was obtained, and entered into a sample custody system to preserve sample integrity for subsequent analysis at the Grand Junction Office (GJO) Analytical Laboratory. The smear samples were secured in a sample box sealed with tamper-evident custody seals at the sample site until the field sampling was complete and then transported to the GJO Analytical Laboratory.

In all, 29 smear samples were collected from the survey unit—one at each of the 29 survey locations. These were submitted to the GJO Analytical Laboratory for radiological analysis. The results of these measurements are summarized in Section 3 and the laboratory analytical report is contained in Appendix C.

2.4.2.2 Surface-Media Sampling

Paint and other surface coatings or residues present on the surfaces of the building can present an obstruction to detection and measurement of the radioactive surface contamination which might be present. To assess the potential for, and measure the concentration of, contaminants which might be present in and/or beneath painted or coated surfaces, a "veneer" of the surface (including any surface coating or residue) is removed. When there is no surface coating or residue present, but the radiological measurement of the surface exceeded the *a priori* estimate of the critical detection level of 22 dpm/100 cm², a veneer of the substrate is collected to assess the potential for a near-surface contamination layer embedded in a porous surface. No sample location met either of the criteria for media sampling, however, 24 media samples were taken to provide adequate statistical data that the mean total transuranic surface contamination on or beneath the surface is less than the DCGL. A disposable plastic containment was erected over the 24 selected sample locations. A heavy duty, rotary impact drill (Figure 2-5) was fitted with a special bit designed to pulverize the surface without drilling into it. The bit was inserted through a port in the containment. Only the bit penetrated the containment. The impact tool was moved over the surface removing the thinnest possible layer until all surface coating within the 100 cm² sample area was removed.

To be inserted later—PHOTO OF THE DRILL AND BIT

Figure 2-5. Photo of Rotary Impact Drill and Bit

The surface material removed (the sample) was collected in the bottom of the plastic containment. The technician collected the removed media as a sample. The sample was then transferred to a small sealable plastic vial. A bar code label linking the sample location from which it was obtained was affixed to the vial and entered into a sample custody system to preserve sample integrity for subsequent analysis at the GJO Analytical Laboratory (see Figure 2-6). The vials were placed in a sealable plastic bag and secured in a sample box sealed with tamper-evident custody seals at the sample site until the field sampling was complete and then transported to the analytical laboratory.

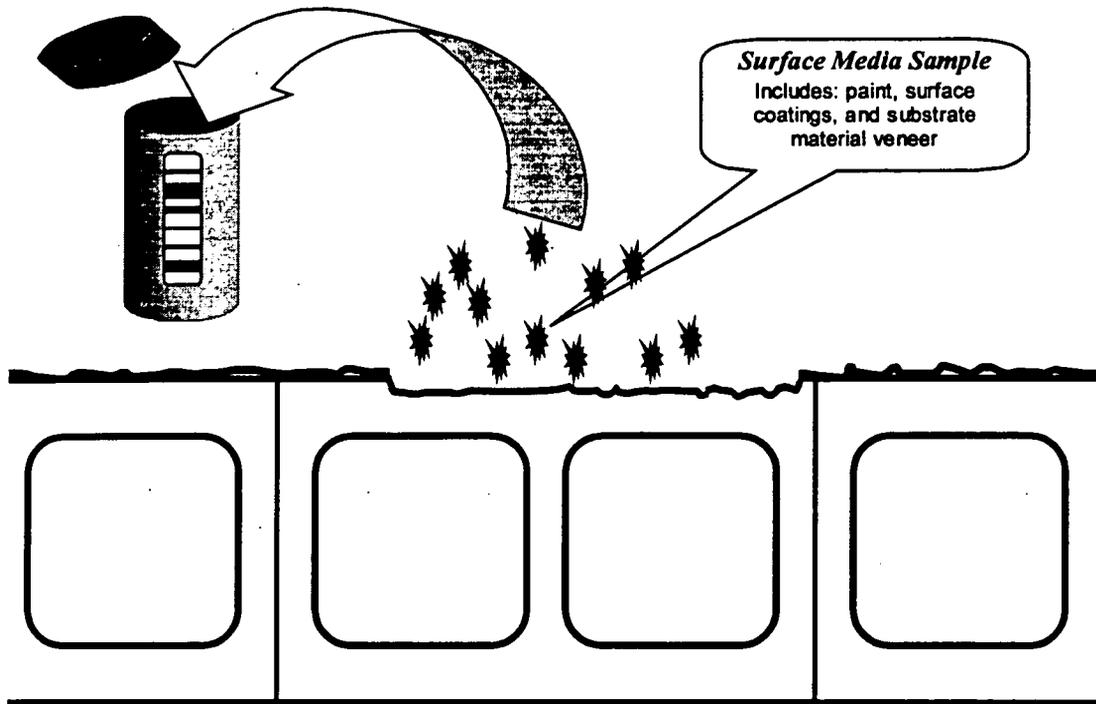


Figure 2-6. Surface Media Sample Collection

2.4.3 Laboratory Measurements

Smears and surface media samples were processed and analyzed at the GJO Analytical Laboratory using the methods and procedures identified in Tables 2-2 and 2-3 and prescribed in the IV SAP.

Table 2-2. Smear Sample Analytical Method

Laboratory Method—Gross Alpha Radioactivity	
Counting method	Gas Proportional Low-Background Alpha/Beta Counting System
Instrumentation	Canberra Model 2404
Procedure(s)	Procedure RC-8, "Gross Alpha/Beta Analysis" (WASTREN-GJ)
Laboratory procedures are governed by QA/QC procedures specified in Handbook of Analytical and Sample-Preparation Procedures (WASTREN-GJ).	

Table 2-3. Surface Media Sample Analytical Method

Laboratory Method—Alpha Radioactivity by Isotope Specific Species	
Counting method	Alpha radioactivity by alpha spectroscopy
Instrumentation	1" PIPS with Canberra Alpha Management Software (AMS) Model 48-0721, Ver. 1.0
Procedure(s)	Solids Digestion, Chemical Extraction, Sample Precipitation, and Sample Counting Procedure RC-19, "Alpha Spectrometry" (WASTREN-GJ).
Laboratory procedures are governed by QA/QC procedures specified in Handbook of Analytical and Sample-Preparation Procedures (WASTREN-GJ).	

Based on the EPA's terminology, the methods described in Tables 2-2 and 2-3 are categorized as Analytical Level V because they are non-conventional in the EPA's Contract Laboratory Program (CLP) (EPA 1988). However, comparing the level of quality assurance and quality control (QA/QC) embodied in these procedures, they are comparable to EPA's CLP Analytical Level IV.

2.4.4 Field Measurements

2.4.4.1 Background Determination

Background was determined in the survey unit being surveyed before, and at least every 2 hours during, each sampling shift. Additionally, background measurements were collected immediately prior to, and immediately after, changing out a detector probe. In the center of the survey unit, a masonite hardboard surface (the back of a clipboard) that has essentially no inherent alpha radioactivity and which was clearly "unaffected" (i.e., clearly not part of the potentially contaminated buildings within the 779 Cluster) was used for establishing background according to the procedure detailed in the SAP. This method establishes the background associated with the instrument only. Background measurements were recorded both electronically and by hand.

2.4.4.2 Direct Static Surface Radioactivity Measurements

Each of the 29 sample locations identified within the survey unit was directly measured to assess the alpha radioactivity deposited on the surface. Direct static field measurements were made using the approved procedure in the IV SAP. Each measurement was collected for 90 seconds, in the instrument's "SCALER" operating mode, and at a fixed distance of approximately 0.125 inch (1/8th inch) from the surface. When the acquisition count time was complete, the result was read, manually recorded, and electronically logged into the instrument's memory. No direct measurement result was greater than the instrument's *a priori* critical detection level (L_c) of 22 dpm/100 cm² to trigger the need to collect a surface media sample although 24 media samples were collected. Where these media samples were taken, a second direct static measurement was made at the same location following removal of the surface veneer. Three of the direct measurement readings obtained subsequent to the veneer removal were greater than the L_c indicating the likelihood that the concrete substrate contained an appreciable and measurable alpha background radioactivity¹. In these circumstances, a field decision was made as to the need for the collection of additional surface media to determine compliance with the DCGLs. Pertinent observations regarding the nature of the surface, substrate material, or

¹To avoid the need for making reference survey unit measurements to characterize and quantify natural radioactivity, background has been narrowly defined in the Contractor's Closeout Radiological Survey Plan to include only radiation measured by the instrument system operating in "free air". This definition excludes radioactivity which might be present in the building materials but which has not been contributed or added by DOE. All naturally occurring radioactivity measured during Final Status Survey is to be considered "contributed" or attributable to DOE activities and compared to the applicable DCGLs.

instrument response were recorded. No anomalies were noted during the direct static measurement process.

3.0 Sampling and Survey Results

Sampling and survey results are divided into four basic categories for discussion, analysis, and comparison with the applicable DCGLs. The categories correspond to the three fundamental samples or measurements employed in the independent verification: Smear Sampling, Direct Static Measurements, and Surface Media Samples. The fourth category is for QC data. QC data is presented in Section 6.0 of this report.

3.1 Direct Static Field Measurements

Direct measurements of the radioactivity emission from surfaces were made using static, 90-second counting intervals, over which the total counts were integrated. The measurements recorded were gross values normalized to $\text{dpm}/100 \text{ cm}^2$. In the context of this sampling evolution, a "gross measurement" means a measurement made with a radiation detection instrument to which no background correction has been applied. Raw or gross data is important when measurements will be used to make statistical inferences, since not all data will necessarily have the same correction factors applied to properly reduce them to meaningful numbers. Reporting gross or raw data also permits one to analyze the functionality of the instrument with which the measurement was made, and to verify the appropriateness of the data reduction process. The data reduction process for the field measurement data collected in this sampling evolution involves corrections for the efficiency of the radiation detector to the subject radiation and the instrument response to background sources of radiation (excluding surface media contribution to background).

The use of the Eberline E-600 Smart Portable Multi-purpose Radiation Survey Instrument in this application provides a platform for accommodating the probe specific factors including efficiency, high voltage, discrimination thresholds, crossover correction factors, and calibration set up parameters within the detector's associated "smart pack" microchip. These correction factors are common to all of the direct field measurements made with the E-600 and HP-100 detector for this SAP. As a result of incorporating these factors, the instrument reads out and electronically logs data points directly in units of $\text{dpm}/100 \text{ cm}^2$. These readings were not, however, field corrected for background radiation.

3.1.1 Background Measurements

The assessment of an instrument's response to background radiation is important from two perspectives. First, it permits the assessment of the minimum sensitivity (detection limit) for the instrument and measurement process in the presence of background radiation. The *a posteriori* minimum detectable activity (MDA) is calculated from this actual background data. Second, by assessing the instrument's response to background radiation in terms of the units that field data will be collected, a correction can be applied to the field measurement data to permit determination of radioactivity present in excess of background. Because the naturally occurring concentrations of background radioactivity in building materials used in the construction of the buildings in the 779 Cluster were expected to be below and well within the DCGL benchmarks for radioactive contamination on building surfaces, the Contractor chose to assign all building material background radioactivity as part of the DOE contributed activity for comparison against the DCGL. As a result, no attempt was made to measure the concentrations of naturally occurring radioactivity measurable on surfaces in a "reference survey unit" or unaffected area. Still, there was the need to measure and account for the instrument's response to other sources of

background radiation (e.g., cosmic radiation) which could otherwise not be distinguished from the contaminant of concern.

To accommodate the need for correcting the instrument data for sensitivity to background radiation, excluding that present in the substrate of the surfaces being measured, instrument background measurements were collected periodically over the sampling period. In all, 30 measurements of the alpha background radiation level were recorded over the sampling period in accordance with the procedure for determining background (DOE 1999a). Each background measurement made during the sampling period is presented in Table 3-1.

Table 3-1. Direct Static Measurement Background Data, Main Building, Survey Unit 779-35

Sample Location	Date	Time	Recorded Value	Units
BACKGROUND	11/22/99	10:29:00	12.40	dpm/100cm ²
BACKGROUND	11/22/99	10:31:00	20.70	dpm/100cm ²
BACKGROUND	11/22/99	10:33:00	16.60	dpm/100cm ²
BACKGROUND	11/22/99	11:42:00	12.40	dpm/100cm ²
BACKGROUND	11/22/99	11:43:00	12.40	dpm/100cm ²
BACKGROUND	11/22/99	11:47:00	4.14	dpm/100cm ²
BACKGROUND	11/22/99	14:14:00	24.80	dpm/100cm ²
BACKGROUND	11/22/99	14:16:00	20.70	dpm/100cm ²
BACKGROUND	11/22/99	14:19:00	12.40	dpm/100cm ²
BACKGROUND	11/22/99	15:19:00	24.80	dpm/100cm ²
BACKGROUND	11/22/99	15:21:00	24.80	dpm/100cm ²
BACKGROUND	11/22/99	15:24:00	16.60	dpm/100cm ²
BACKGROUND	11/23/99	10:38:00	11.00	dpm/100cm ²
BACKGROUND	11/23/99	10:39:00	14.20	dpm/100cm ²
BACKGROUND	11/23/99	10:43:00	14.40	dpm/100cm ²
BACKGROUND	11/23/99	11:48:00	4.28	dpm/100cm ²
BACKGROUND	11/23/99	11:49:00	17.70	dpm/100cm ²
BACKGROUND	11/23/99	11:51:00	10.80	dpm/100cm ²
BACKGROUND	11/23/99	12:25:00	17.90	dpm/100cm ²
BACKGROUND	11/23/99	12:26:00	18.00	dpm/100cm ²
BACKGROUND	11/23/99	12:28:00	14.60	dpm/100cm ²
BACKGROUND	11/30/99	14:31:00	18.00	dpm/100cm ²
BACKGROUND	11/30/99	14:32:00	11.10	dpm/100cm ²
BACKGROUND	11/30/99	14:34:00	11.10	dpm/100cm ²
BACKGROUND	11/30/99	15:43:00	21.40	dpm/100cm ²
BACKGROUND	11/30/99	15:47:00	14.20	dpm/100cm ²
BACKGROUND	11/30/99	15:49:00	14.50	dpm/100cm ²
BACKGROUND	11/30/99	17:10:00	11.60	dpm/100cm ²
BACKGROUND	11/30/99	17:11:00	11.50	dpm/100cm ²
BACKGROUND	11/30/99	17:15:00	15.00	dpm/100cm ²

From these measurements, it was determined that background did not change appreciably over the duration of the sampling period nor was it significantly different when measured with different detector probes. When the direct static measurement background data is analyzed both graphically and with goodness-of-fit tests (Figure 3-1), it shows that the measurements are better represented by, or fit to, a normal distribution. The direct static field measurements collected in

DATA EVALUATION STATISTICS

Data Description

"Free Air" Instrument Background
 Building 779 Cluster Independent Verification Project
 Building 779, Main Building, Survey Unit 779-35

Critical Level	22
UNITS - dpm/100 cm²	
Sample Data	
4.14	
4.28	
10.80	
11.00	
11.10	
11.10	
11.50	
11.60	
12.40	
12.40	
12.40	
12.40	
14.20	
14.20	
14.40	
14.50	
14.60	
15.00	
16.60	
16.60	
17.70	
17.90	
18.00	
18.00	
20.70	
20.70	
21.40	
24.80	
24.80	
24.80	

Descriptive Statistics

Number of Samples	30.000
Mean	15.134
Median	14.450
Standard Deviation	5.193
CV	0.343159
Range	20.660
Minimum	4.140
Maximum	24.800
GM	14.098
GSD	1.517
Mean of LN(Data)	2.646
SD of LN(Data)	0.416
Percent > Critical Level	10.000

Normal Statistics

Mean	15.134
UCL(Mean) - Z	16.992
LCL(Mean) - Z	13.276
95%ile - Z	23.677
Percent > Critical Level	9.307
W Test (Data)	0.94525
Normal (a=0.05)?	Yes

Lognormal Statistics

GM	14.098
GSD	1.517
AM of data	15.134
AM - MVUE	15.327
AM - MLE	15.375
UCL - Norm t stats	17.073
LCL - Norm t stats	13.195
UCL LogNorm t	17.962
LCL LogNorm t	13.161
UCL - Modified Cox	18.029
LCL - Modified Cox	13.031
UCL - "Exact"	
LCL - "Exact"	
95%ile	27.968
UTL 95%, 95%	35.535
Percent > Critical Level	14.262
PEP (Upper)	23.561
PEP (Lower)	6.631784
W Test (ln Data)	0.852843
Lognorm (a=0.05)?	No

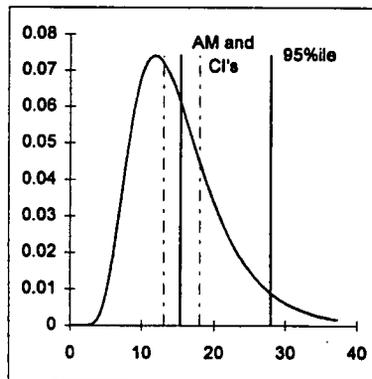
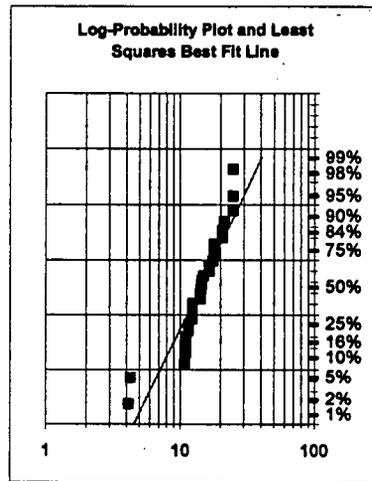
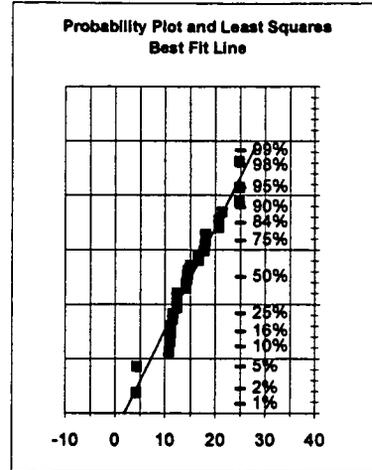


Figure 3-1. Data Evaluation Statistics—"Free Air" Instrument Background

26

the survey unit also fit a normal distribution (see Section 3.1.2). The variance in the recorded background data was small and within the range expected for a gas proportional counter measuring alpha background radiation (see Appendix E for complete background data set).

Table 3-2 shows the background data summary statistics.

Table 3-2. Background Data Summary Statistics, Main Building, Survey Unit 779-35.

Statistic	Value
Number of Measurements	30
Arithmetic Mean	15.13
Standard Deviation (sample)	5.19
Coefficient of Variation	0.34
Max	24.80
Median	14.45
Minimum	4.14
Range	20.66
Geometric Mean	14.10
UCL (normal "t", a=0.05)	17.07
LCL (normal "t", b=0.05)	13.20

3.1.1.1 Background Adjustment

Because the background and survey unit sample sets were each normally distributed, it was decided that the arithmetic (or normal) mean background value recorded over the sampling period (15.1 dpm/100 cm²) would be used to correct the gross direct static surface contamination measurements for subsequent comparison to the applicable DCGL. In some situations, a graphical or visual distinction can be made between measurements containing background only and those with added radioactivity. For example, when elevated or contributed activity is present, a graphical distinction can be clearly seen between the population of measurements containing only background response and those containing elevated or contributed activity. This is not typically the case with alpha radioactivity. No graphic distinction between measurement results attributable to background and those with activity in excess of background is clearly discernable with this data set.

Calculational methods are needed to assess the surface activity above background that could be distinguished with statistical significance from background. As discussed earlier, the arithmetic mean instrument background measurement over the field sampling period was 15.1 dpm/100 cm². With the E-600 instruments used, the background radiation influence on the instrument's readings was processed with efficiency corrections and probe size corrections such that background measurements and sample measurements alike read out in units of dpm/100 cm². In order to calculate the statistically significant surface activity which could be distinguished from background (*a posteriori* MDA), it was necessary to convert the background measurement units from dpm/100 cm² to units of counts per minute (cpm). In this case, the more conservative metric, the arithmetic mean, was chosen to calculate the detection sensitivity achieved to prevent overstating the actual sensitivity achieved. The converted mean background count rate for the sampling period is 3.04 cpm (Table 3-3). Using the actual instrument field measurement parameters, a calculation of the actual field measurement MDA can be determined by solving Equation 3-1.

Table 3-3. Static Surface Contamination Measurement MDA Parameters

Parameter		Value Used	Remarks
C _b	Background Counts	4.57	Value used is 15.134 dpm/100 cm ² converted to units of counts (cpm × T _s)
T _s	Sample count time (in minutes)	1.5	Count time programmed into the calibrated instrument specifically for this sampling event
A _p	Probe size	100	cm ²
ε _T	Instrument system efficiency in counts/disintegration	0.2013 (20.13 percent)	Actual efficiency for the individual probe is programmed into the memory chip of the probes' smart pack and for the two probes used was 20.76 and 19.49. These represent effectively equivalent measures of efficiency and probe performance.

The following calculations define the *a posteriori* MDA.

$$MDA = \frac{3 + 4.65\sqrt{C_b}}{T_s \times \frac{A_p}{100\text{cm}^2} \times \epsilon_T} \quad (3-1)$$

Where: MDA = the minimum surface activity concentration above background radioactivity (in dpm/100 cm²) that can be detected with 95 percent confidence.

C_b = the total number of background counts over the sample count period (T_s).

T_s = sample count time (in minutes).

A_p = probe size (in cm²).

ε_T = counting system efficiency in count/disintegration.

$$MDA = \frac{3 + 4.65\sqrt{4.57}}{1.5 \times 1 \times 0.2013} \quad (3-2)$$

$$MDA = \frac{12.94}{0.302} = 43 \text{ dpm/100 cm}^2 \quad (3-3)$$

Therefore the "gross" field instrument reading, using the procedures identified in the Building 779 Cluster IV SAP, which can be distinguished as different from background (the adjusted gross MDA) is:

$$15 + 43 = 58 \text{ dpm/100 cm}^2 \quad (3-4)$$

Having identified the *a posteriori* MDA for the field sampling measurements and the adjusted gross MDA, a simple sort of the gross field measurement data points was performed to identify those which were greater than 58 dpm/100 cm². Those locations with gross surface activity greater than the adjusted gross MDA are credited as positive indicators of added radioactivity, while those less than the adjusted gross MDA are statistically indistinguishable from background values.

Rather than correct each individual measurement for background, the gross measurement data set was statistically analyzed. The data set was treated as normally distributed, the best fit for the data set collected. This treatment conforms to standard EPA methodology for data evaluation

statistics, and generally yields conservative estimates of the upper confidence intervals and percentiles values. To correct for the instrument's response to background, the geometric mean background, 14.1 dpm/100 cm², was subtracted from the geometric mean of the total surface activity measured by surface emission data set of interest. When comparisons of other metrics (e.g., the median) are provided for information, the comparable background metric is also used to correct the reading for background radiation influence. For example, when the net (background corrected) median direct static surface contamination metric is reported, the median value of the background data set has been subtracted from the median value of the gross direct static surface contamination measurement data set.

3.1.2 Field Measurement Data

Direct static measurements were made at the 29 selected sample locations in survey unit 779-35. Figure 2-2 shows the layout of survey unit 779-35 and the sample locations selected in accordance with the sample allocation protocol identified in the IV SAP (DOE 1999a). They were made prior to collection of a smear sample at the location and prior to collecting a surface media sample. In this way, the "total" surface deposited activity emission rate, whether from fixed or removable radioactivity, was accounted for. In all, 35 direct static surface measurements were made prior to collecting surface samples. Five of these were replicate measurements collected as part of the overall QA/QC as described in the SAP. For data reduction purposes, the arithmetic mean of a replicate measurement and the corresponding initial measurement was used as the reported value for a specific sample location at which a replicate measurement was made. Consequently, there are a total of 29 data points (Table 3-4) included in the overall characterization of the building's mean residual surface contamination level as measured by direct surface emission. Further information about the duplicate samples and the assurance of precision and variability are presented in Sections 6.0 and 7.0.

A number of statistical tests of the data were performed to assess the data sets. A key test of the data set is for goodness-of-fit. It is important because it identifies the underlying distribution of the data set and permits the analyst as well as the decision makers and risk managers to compare appropriate metrics calculated from the data. The W-test was used to measure the relative goodness of the fit of the observed data distribution to both the normal and log-normal standard distributions. Other distributions were not entertained for this data set since the data were expected to be either normally or log-normally distributed (based on knowledge of radioactivity distribution in the environment and in background) and because the probability plots and histograms generated gave no evidence that other than normal or log-normal distributions might be present. For the direct static measurement data set, the W-test identified the normal distribution as the best fit. The data evaluation statistics are provided in Figure 3-2. Table 3-5 summarizes the direct surface measurement data, uncorrected for background, collected in survey unit 779-35.

Table 3-4. Direct Static Surface Contamination Measurements, Main Building, Survey Unit 779-35

Sample Location	Instrument Operating Mode	Channel Selected	Background Compensation Mode	Recorded Value	Units
IVP0000271	Scaler	Alpha	Gross	8.28	dpm/100cm ²
IVP0000272	Scaler	Alpha	Gross	16.60	dpm/100cm ²
IVP0000273	Scaler	Alpha	Gross	16.60	dpm/100cm ²
IVP0000274	Scaler	Alpha	Gross	12.40	dpm/100cm ²
IVP0000275	Scaler	Alpha	Gross	16.60	dpm/100cm ²
IVP0000276	Scaler	Alpha	Gross	8.28	dpm/100cm ²
IVP0000277	Scaler	Alpha	Gross	4.14	dpm/100cm ²
IVP0000278	Scaler	Alpha	Gross	16.60	dpm/100cm ²
IVP0000279	Scaler	Alpha	Gross	16.60	dpm/100cm ²
IVP0000280	Scaler	Alpha	Gross	4.14	dpm/100cm ²
IVP0000281	Scaler	Alpha	Gross	4.14	dpm/100cm ²
IVP0000282	Scaler	Alpha	Gross	12.40	dpm/100cm ²
IVP0000283	Scaler	Alpha	Gross	4.14	dpm/100cm ²
IVP0000284	Scaler	Alpha	Gross	7.38	dpm/100cm ²
IVP0000285	Scaler	Alpha	Gross	20.00	dpm/100cm ²
IVP0000286	Scaler	Alpha	Gross	13.20	dpm/100cm ²
IVP0000287	Scaler	Alpha	Gross	20.50	dpm/100cm ²
IVP0000288	Scaler	Alpha	Gross	8.29	dpm/100cm ²
IVP0000289	Scaler	Alpha	Gross	16.80	dpm/100cm ²
IVP0000290	Scaler	Alpha	Gross	13.40	dpm/100cm ²
IVP0000291	Scaler	Alpha	Gross	13.20	dpm/100cm ²
IVP0000292	Scaler	Alpha	Gross	16.60	dpm/100cm ²
IVP0000293	Scaler	Alpha	Gross	16.40	dpm/100cm ²
IVP0000294	Scaler	Alpha	Gross	18.30	dpm/100cm ²
IVP0000295	Scaler	Alpha	Gross	20.30	dpm/100cm ²
IVP0000296	Scaler	Alpha	Gross	6.17	dpm/100cm ²
IVP0000297	Scaler	Alpha	Gross	9.92	dpm/100cm ²
IVP0000298	Scaler	Alpha	Gross	13.20	dpm/100cm ²
IVP0000299	Scaler	Alpha	Gross	13.45	dpm/100cm ²

DATA EVALUATION STATISTICS

Data Description

Direct Static Surface Measurements
 Building 779 Cluster Independent Verification Project
 Building 779, Main Building, Survey Unit 779-35

DCGL	100
UNITS - dpm/100 cm ²	
Sample Data	
4.14	
4.14	
4.14	
4.14	
6.17	
7.38	
8.28	
8.28	
8.29	
9.92	
12.40	
12.40	
13.20	
13.20	
13.20	
13.40	
13.45	
16.40	
16.60	
16.60	
16.60	
16.60	
16.60	
16.60	
16.80	
18.30	
20.00	
20.30	
20.50	

Descriptive Statistics		
Number of Samples		29.000
Mean		12.691
Median		13.200
Standard Deviation		5.201
CV		0.409792
Range		16.360
Minimum		4.140
Maximum		20.500
GM		11.378
GSD		1.676
Mean of LN(Data)		2.432
SD of LN(Data)		0.517
Percent > DCGL		0.000
Normal Statistics		
Mean		12.691
UCL(Mean) - Z		14.583
LCL(Mean) - Z		10.798
95%ile - Z		21.246
Percent > DCGL		0.000
W Test (Data)		0.913883
Normal (a=0.05)?		No
Lognormal Statistics		
GM		11.378
GSD		1.676
AM of data		12.691
AM - MVUE		12.935
AM - MLE		13.002
UCL - Norm t stats		14.669
LCL - Norm t stats		10.713
UCL LogNorm t		15.826
LCL LogNorm t		10.682
UCL - Modified Cox		15.953
LCL - Modified Cox		10.489
UCL - "Exact"		
LCL - "Exact"		
95%ile		26.617
UTL 95%, 95%		36.092
Percent > DCGL		0.001
PEP (Upper)		0.038
PEP (Lower)		3.16E-06
W Test (ln Data)		0.845786
Lognorm (a=0.05)?		No

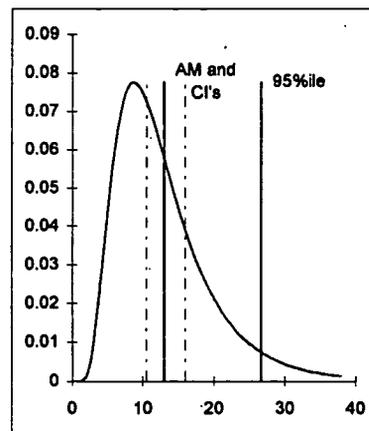
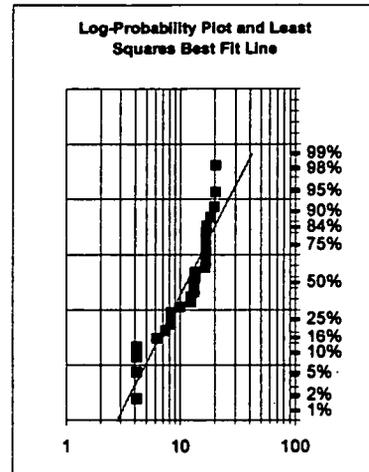
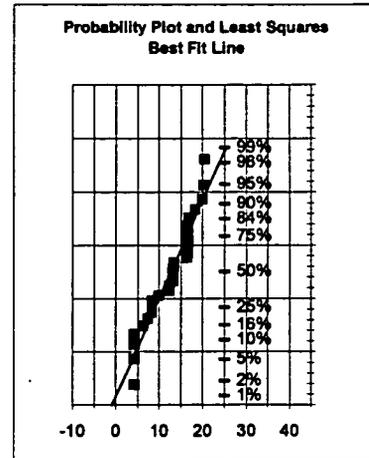


Figure 3-2. Data Evaluation Statistics—Direct Static Surface Measurements

31

Table 3-5. Summary Statistics, Direct Static Measurements, Main Building, Survey Unit 779-35

Statistic	Value
Number of Measurements	29
Arithmetic Mean	12.69
Standard Deviation (sample)	5.20
Coefficient of Variation	0.41
Max	20.50
Median	13.20
Minimum	4.14
Range	16.36
Geometric Mean	11.38
UCL (normal "t", a=0.05)	14.67
LCL (normal "t", b=0.05)	10.71

From Table 3-5 and the data evaluation and summary statistics, it is evident that more than 50 percent of all the measurements in this subset are below the arithmetic mean background value of 15.1 dpm/100 cm² and all are below the critical detection level of 22 dpm/100 cm². All measurements are significantly below the adjusted gross minimum detectable activity (MDA_{Gross}) of 58 dpm/100 cm² for the field measurement process.

The test of DCGL_w for total surface contamination concentration as measured by direct surface emission is the mean (the arithmetic mean in this case since the data set is determined to be normally distributed) of the data set. Section 4.0 provides detailed analysis of the data set in comparison to the applicable DCGL values.

3.1.2.1 Post-Surface Media Sampling Measurements

Follow-up direct static measurements are made after each surface media sample is collected in an effort to assure that all of the contaminant, which might be present beneath the immediate surface, is removed by the physical sampling process. This measurement is necessary to validate the assumption that any contaminant that may have been deposited beneath a paint layer or embedded in the porous substrate is limited to only shallow deposition and would be collected and measured by the surface media sampling. Evidence of elevated radioactivity by direct measurement after a thin surface veneer had been removed might call into question the validity of that assumption, requiring further investigation. The results, however, are not considered in the data set used to evaluate compliance with the DCGL_w for total surface contamination as measured by direct surface emission. Nonetheless, the post-surface media sampling measurements are considered important since they might detect radioactivity that is potentially "hidden" from detection by direct surface emission measurements made before removal of the surface coating or veneer.

A total of 24 surface media samples (Table 3-6) were collected even though no sample location met the stringent surface media sample inclusion criteria (DOE 1999a). A total of 24 direct static surface measurements were made at the 24 surface media sample locations subsequent to collecting surface samples.

Table 3-6. Post-Surface Media Sample Direct Static Surface Measurements

Sample Location	Instrument Operating Mode	Channel Selected	Background Compensation Mode	Recorded Value	Units
IVP0000275	Scaler	Alpha	Gross	10.40	dpm/100cm ²
IVP0000276	Scaler	Alpha	Gross	13.60	dpm/100cm ²
IVP0000277	Scaler	Alpha	Gross	7.12	dpm/100cm ²
IVP0000278	Scaler	Alpha	Gross	6.48	dpm/100cm ²
IVP0000279	Scaler	Alpha	Gross	23.60	dpm/100cm ²
IVP0000281	Scaler	Alpha	Gross	6.69	dpm/100cm ²
IVP0000282	Scaler	Alpha	Gross	13.20	dpm/100cm ²
IVP0000283	Scaler	Alpha	Gross	14.00	dpm/100cm ²
IVP0000284	Scaler	Alpha	Gross	10.60	dpm/100cm ²
IVP0000285	Scaler	Alpha	Gross	9.77	dpm/100cm ²
IVP0000286	Scaler	Alpha	Gross	9.81	dpm/100cm ²
IVP0000287	Scaler	Alpha	Gross	6.88	dpm/100cm ²
IVP0000288	Scaler	Alpha	Gross	7.00	dpm/100cm ²
IVP0000289	Scaler	Alpha	Gross	16.90	dpm/100cm ²
IVP0000290	Scaler	Alpha	Gross	3.47	dpm/100cm ²
IVP0000291	Scaler	Alpha	Gross	17.00	dpm/100cm ²
IVP0000292	Scaler	Alpha	Gross	23.90	dpm/100cm ²
IVP0000293	Scaler	Alpha	Gross	20.50	dpm/100cm ²
IVP0000294	Scaler	Alpha	Gross	7.11	dpm/100cm ²
IVP0000295	Scaler	Alpha	Gross	17.30	dpm/100cm ²
IVP0000296	Scaler	Alpha	Gross	23.90	dpm/100cm ²
IVP0000297	Scaler	Alpha	Gross	13.80	dpm/100cm ²
IVP0000298	Scaler	Alpha	Gross	17.00	dpm/100cm ²
IVP0000299	Scaler	Alpha	Gross	13.80	dpm/100cm ²

Again, a number of statistical tests of the data were performed to assess the data set. The W-test was used to measure the relative goodness of the fit of the observed data distribution. The W-test and histogram showed the data set to be log-normally distributed. The data evaluation statistics are provided in Figure 3-3. Table 3-7 summarizes the post-surface media sampling direct surface measurement data, uncorrected for background, collected in survey unit 779-35.

Table 3-7. Summary Statistics, Post-Surface Media Sampling Direct Static Measurements, Main Building, Survey Unit 779-35

Statistic	Value
Number of Measurements	24
Arithmetic Mean	13.08
Standard Deviation (sample)	5.98
Coefficient of Variation	0.46
Max	23.90
Median	13.40
Minimum	3.47
Range	20.43
Geometric Mean	11.70
UCL (normal "t", a=0.05)	15.60
LCL (normal "t", b=0.05)	10.55

DATA EVALUATION STATISTICS

Data Description

Direct Static Surface Measurements (Post Surface Media Sampling)
 Building 779 Cluster Independent Verification Project
 Building 779, Main Building, Survey Unit 779-35

DCGL 100

UNITS - dpm/100 cm²

Sample Data

- 3.47
- 6.48
- 6.69
- 6.88
- 7.00
- 7.11
- 7.12
- 9.77
- 9.81
- 10.40
- 10.60
- 13.20
- 13.60
- 13.80
- 13.80
- 14.00
- 16.90
- 17.00
- 17.00
- 17.30
- 20.50
- 23.60
- 23.90
- 23.90

Descriptive Statistics

Number of Samples	24.000
Mean	13.076
Median	13.400
Standard Deviation	5.984
CV	0.45759
Range	20.430
Minimum	3.470
Maximum	23.900
GM	11.700
GSD	1.651
Mean of LN(Data)	2.460
SD of LN(Data)	0.502
Percent > DCGL	0.000

Normal Statistics

Mean	13.076
UCL(Mean) - Z	15.470
LCL(Mean) - Z	10.682
95%ile - Z	22.919
Percent > DCGL	0.000
W Test (Data)	0.933401
Normal (a=0.05)?	Yes

Lognormal Statistics

GM	11.700
GSD	1.651
AM of data	13.076
AM - MVUE	13.191
AM - MLE	13.268
UCL - Norm t stats	15.603
LCL - Norm t stats	10.550
UCL LogNorm t	16.398
LCL LogNorm t	10.736
UCL - Modified Cox	16.524
LCL - Modified Cox	10.531
UCL - "Exact"	
LCL - "Exact"	
95%ile	26.699
UTL 95%, 95%	37.249
Percent > DCGL	0.001
PEP (Upper)	0.040
PEP (Lower)	7.3E-07
W Test (In Data)	0.944076
Lognorm (a=0.05)?	Yes

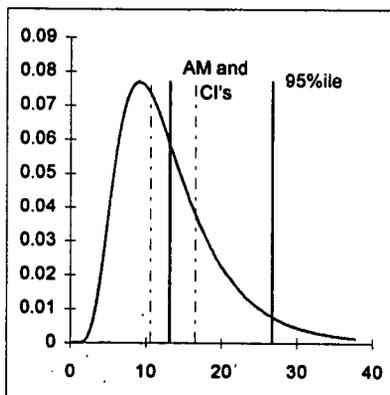
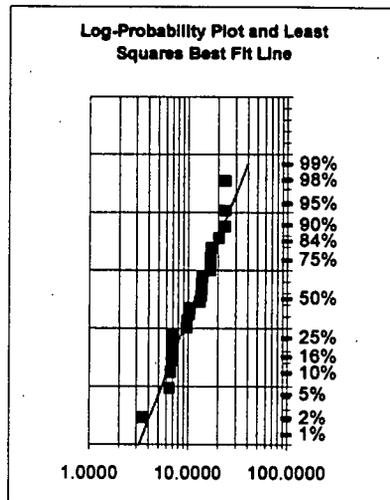
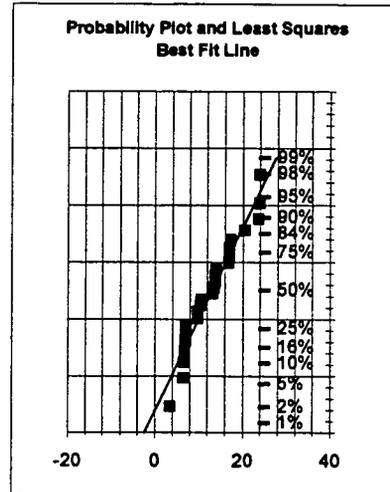


Figure 3-3. Data Evaluation Statistics—Direct Static Surface Measurements (Post-Surface Media Sampling)

The most telling presentation of the post-surface media sampling surface measurements is a side by side comparison of the data set summary statistics with the summary statistics from the direct surface measurements made prior to sampling and the instrument background data collected during the sampling process. Table 3-8 compares the summary statistics from each of these three data sets.

Table 3-8. Comparison of Direct Static Measurement Data Sets Summary Statistics

Statistic	Pre-Surface Media Sampling Measurements Value	Post-Surface Media Sampling Measurements Value	Background Measurements Value
Number of Measurements	29	24	30
Arithmetic Mean	12.69	13.08	15.13
Standard Deviation (sample)	5.20	5.98	5.19
Coefficient of Variation	0.41	0.46	0.34
Max	20.50	23.90	24.80
Median	13.20	13.40	14.45
Minimum	4.14	3.47	4.14
Range	16.36	20.43	20.66
Geometric Mean	11.38	11.70	14.10
UCL (normal "t", a=0.05)	14.67	15.60	17.07
LCL (normal "t", b=0.05)	10.71	10.55	13.20

From the data evaluation and summary statistics, it is evident that the post-surface media sampling direct static measurements show essentially the same activity than those collected prior to sampling and the instrument background measurements made over the sampling period. Slightly higher direct static measurements of activity once the surface layer of concrete had been removed tends to support the possibility that the building materials have a measurable concentration of naturally occurring radionuclides¹. Both the pre- and post-surface media sampling direct static measurement data set are presented side-by-side in Table 3-9.

3.2 Laboratory Measurements

The GJO Analytical Laboratory was used to assay all smear and surface media samples collected for independent verification from survey unit 779-35. The GJO Analytical Laboratory was selected because of its method capabilities, quality program, autonomy, and ability to meet the detection limits specified in the IV SAP (DOE 1999a). In each case, the laboratory met or exceeded the contract required detection limit specified in the SAP. Results of samples analyzed are summarized in the following sections.

¹Although indications point to the possibility of measurable concentrations of naturally occurring radionuclides, particularly in the concrete materials used in the building construction, no credit is taken by attempting to subtract these from the measured values in the building. Instead, all radioactivity measured (other than the instrument background) is assumed to be DOE contributed values and is compared against the applicable DCGL to determine compliance with the DQOs.

Table 3-9. Direct Static Measurement Data Sets, Pre- and Post-Surface Media Sampling

Sample Location	Pre-Surface Media Sampling Direct Static Surface Measurements dpm/100 cm ²	Post-Surface Media Sampling Direct Static Surface Measurements dpm/100 cm ²
IVP0000275	16.60	10.40
IVP0000276	8.28	13.60
IVP0000277	4.14	7.12
IVP0000278	16.60	6.48
IVP0000279	16.60	23.60
IVP0000281	4.14	6.69
IVP0000282	12.40	13.20
IVP0000283	4.14	14.00
IVP0000284	7.38	10.60
IVP0000285	20.00	9.77
IVP0000286	13.20	9.81
IVP0000287	20.50	6.88
IVP0000288	8.29	7.00
IVP0000289	16.80	16.90
IVP0000290	13.40	3.47
IVP0000291	13.20	17.00
IVP0000292	16.60	23.90
IVP0000293	16.40	20.50
IVP0000294	18.30	7.11
IVP0000295	20.30	17.30
IVP0000296	6.17	23.90
IVP0000297	9.92	13.80
IVP0000298	13.20	17.00
IVP0000299	13.45	13.80

3.2.1 Smear Samples

Smear samples were collected at each of the 29 designated sample locations. Smear samples were collected following the initial direct static surface measurement by wiping the surface with an absorbent smear filter media using moderate pressure. The smears were packaged and delivered to the GJO Analytical Laboratory for counting. The 29 smear samples were submitted to the GJO Analytical Laboratory along with two blank and one "spiked" QC smears on November 29, 1999, for analysis. Table 3-10 is provided to aid the reader to keep the sample identification numbers straight. Results and conclusions relative to the QC smear samples are provided in Section 6.0 of this report.

With the exception of the spiked QC samples submitted, the analytical results showed no measurable radioactivity indicating that there is very little likelihood that the DCGL_w for removable surface contamination might be exceeded in the survey unit. Since every sample result was below the detection limit for the analysis (MDA), no statistical inferences can be made for the data set. However, since the method detection limit was significantly below the DCGL_w for removable alpha radioactivity, and each smear sample was shown to have activity less than the detection limit, statistical treatment of the data set is not necessary in order to measure compliance. Table 3-11 summarizes the pertinent information gleaned from the complete analytical report (Requisition #16848). The entire analytical report is provided in Appendix C.

Table 3-10. Smear Sample Identification Crosswalk

Field Sample Location ID# (Location at which the smear was collected)	Unique Sample ID# Assigned to the Smear Sample in the Field	GJO Analytical Laboratory Assigned Sample #
IVP0000271	SMR0000271	263797
IVP0000272	SMR0000272	263798
IVP0000273	SMR0000273	263799
IVP0000274	SMR0000274	263800
IVP0000275	SMR0000275	263801
IVP0000276	SMR0000276	263802
IVP0000277	SMR0000277	263803
IVP0000278	SMR0000278	263804
IVP0000279	SMR0000279	263805
IVP0000280	SMR0000280	263806
IVP0000281	SMR0000281	263807
IVP0000282	SMR0000282	263808
IVP0000283	SMR0000283	263809
IVP0000284	SMR0000284	263810
IVP0000285	SMR0000285	263811
IVP0000286	SMR0000286	263812
IVP0000287	SMR0000287	263813
IVP0000288	SMR0000288	263814
IVP0000289	SMR0000289	263815
IVP0000290	SMR0000290	263816
IVP0000291	SMR0000291	263817
IVP0000292	SMR0000292	263818
IVP0000293	SMR0000293	263819
IVP0000294	SMR0000294	263820
IVP0000295	SMR0000295	263821
IVP0000296	SMR0000296	263822
IVP0000297	SMR0000297	263823
IVP0000298	SMR0000298	263824
IVP0000299	SMR0000299	263825
SPIKE, 259768	SMR0000597	263826
BLANK, 259733	SMR0000598	263827
BLANK, 259734	SMR0000599	263828

Table 3-11. Summary of Analytical Report Data for Smears

Number of Samples	29 (263797 through 263825)
Method Detection Limit ($\alpha=0.05$)	4.73 dpm/100cm ²
Removable Alpha Surface Radioactivity (dpm/100cm ²)	All smear samples were less than (<) MDA
Sample Count Time	6 minutes

3.2.2 Surface Media Samples

Surface media samples are collected at each sample locations when either of two conditions are satisfied (DOE 1999a). First, a sample is collected at each location where a surface coating or residue, such as paint, is present on the selected surface. Second, a sample is collected at each location where the direct static surface measurement exceeds L_c , 22 dpm/100 cm², indicating the possible presence of measurable DOE added radioactivity. No sample location met either of the two criteria for media sampling, however 24 surface media samples were collected to provide adequate statistical data in determining that the mean total contamination attributable to radioactivity on and beneath a surface is below the DCGL.

In order to achieve the required detection sensitivity and to distinguish between transuranic and uranium series radionuclides, alpha spectroscopy analysis was chosen to assay the surface media samples. Distinction between transuranic and uranium series nuclides is important because radionuclide series specific DCGLs were established for the surface media samples. Sample masses ranged from approximately 8 to 16 grams and were collected over a 100 cm² surface area. The laboratory analyzed each sample for the following radionuclide sets:

- Transuranic Series Isotopes Pu-238, Pu-239/240, and Am-241
- Uranium Series Isotopes U-234, U-235, and U-238

In spectrometric analysis, each isotope has its own counting statistics and detection limit. Many of the sample measurements resulted in one or more of the isotope specific values below the detection limit. When this occurred, a value equal to one half of the sample specific detection limit was used to calculate the total radionuclide series activity. Collated data has been derived from the complete analytical report (Requisition #16848) and presented in Table 3-12. The entire analytical report is provided in Appendix C.

From summary data presented in Table 3-12, several features are apparent:

- Isotopic assay of the contaminants found on and beneath the concrete surfaces in the Main Building indicate the persistent presence of uranium series radionuclides. Each of the 24 samples collected showed detectable concentrations of the two uranium isotopes found most abundantly in nature, U-234 and U-238. This is indicative of the presence of background contributions of these nuclides and is consistent with the background contributions expected in concrete and cinder block materials (NRC 1997).
- Three samples (MED0000275, 276, and 278) from among the 24 collected showed the presence of transuranic radioactivity. These samples were collected from the floor in room 222. The Contractor had earlier identified radioactive contamination in this room and performed a decontamination process to remove it to below the applicable DCGL value. All but two sample results had one or more of the transuranic nuclides of interest at concentrations below the detection level.

Table 3-12. Surface Media Sample Data, Main Building, Survey Unit 779-35—Alpha Isotopic Analysis

Sample Location	Lab Sample ID#	Sample Weight (grams)	Am-241		Pu-238		Pu-239/240		U-234		U-235		U-238		Total Transuranic Activity	Total Uranium Activity
			Reported Value	Reported Value (w/ samples less than MDA @ 0.5 MDA)	Reported Value	Reported Value (w/ samples less than MDA @ 0.5 MDA)	Reported Value	Reported Value (w/ samples less than MDA @ 0.5 MDA)	Reported Value	Reported Value (w/ samples less than MDA @ 0.5 MDA)	Reported Value	Reported Value (w/ samples less than MDA @ 0.5 MDA)	Reported Value	Reported Value (w/ samples less than MDA @ 0.5 MDA)		
IVP0000275	263921	12.71	2.34	2.34	0.35	0.18	11.97	11.97	22.39	1.64	1.64	23.25	14.49	47.28		
IVP0000276	263922	10.86	2.99	2.99	2.24	2.24	128.90	128.90	16.66	0.95	0.48	16.19	134.13	33.33		
IVP0000277	263923	11.91	0.91	0.91	1.10	0.55	2.10	2.10	15.91	1.30	0.65	21.74	3.56	38.30		
IVP0000278	263924	15.61	9.01	9.01	0.79	0.40	10.23	10.23	20.12	2.27	2.27	19.55	19.64	41.94		
IVP0000279	263925	16.39	1.92	1.92	2.59	2.59	2.07	2.07	32.12	1.69	0.85	31.87	6.58	64.84		
IVP0000281	263926	10.12	0.92	0.46	0.24	0.12	0.88	0.44	18.00	1.04	0.52	21.56	1.02	40.08		
IVP0000282	263927	9.09	0.55	0.28	0.52	0.26	1.33	1.33	19.08	1.40	1.40	17.37	1.87	37.85		
IVP0000283	263928	14.15	1.05	0.53	0.67	0.34	2.30	2.30	41.22	3.52	3.52	41.56	3.16	86.30		
IVP0000284	263929	17.57	1.15	1.15	1.21	0.61	1.46	1.46	39.00	2.15	1.08	36.69	3.22	76.77		
IVP0000285	263930	10.25	0.81	0.81	0.92	0.46	0.52	0.26	17.96	1.16	0.58	19.59	1.53	38.13		
IVP0000286	263931	7.93	0.63	0.32	0.39	0.20	0.48	0.24	16.82	1.19	1.19	19.29	0.75	37.30		
IVP0000287	263932	17.89	0.74	0.74	0.91	0.46	1.60	0.80	31.94	1.76	1.76	28.78	2.00	62.48		
IVP0000288	263933	11.97	0.57	0.29	0.60	0.30	0.82	0.41	23.60	1.08	0.54	26.39	1.00	50.53		
IVP0000289	263934	12.80	0.85	0.85	0.34	0.17	0.70	0.35	22.54	1.39	1.39	23.68	1.37	47.61		
IVP0000290	263935	15.26	0.98	0.98	0.86	0.43	1.31	0.66	25.66	1.98	1.98	28	2.07	55.64		
IVP0000291	263936	11.03	0.73	0.37	1.00	0.50	1.00	0.50	21.67	1.20	0.60	22.31	1.37	44.58		
IVP0000292	263937	12.85	0.76	0.38	0.56	0.28	0.92	0.46	27.20	1.35	0.68	28.41	1.12	56.29		
IVP0000293	263938	7.87	0.66	0.66	0.46	0.23	0.18	0.18	13.64	1.28	1.28	14.55	1.07	29.47		
IVP0000294	263939	10.84	0.66	0.66	0.54	0.27	0.99	0.50	20.87	1.90	0.95	20.04	1.43	41.86		
IVP0000295	263940	7.49	0.59	0.59	0.38	0.19	0.58	0.29	17.77	0.97	0.97	15.74	1.07	34.48		
IVP0000296	263941	13.29	0.56	0.56	0.74	0.37	0.92	0.46	25.87	1.62	1.62	22.23	1.39	49.72		
IVP0000297	263942	13.42	0.56	0.56	0.90	0.45	0.99	0.50	21.37	1.81	0.91	22.32	1.51	44.60		
IVP0000298	263943	9.55	0.56	0.28	0.58	0.29	0.64	0.64	18.02	1.05	1.05	18.06	1.21	37.13		
IVP0000299	263944	15.43	1.23	0.62	0.88	0.44	1.21	0.61	34.28	1.87	0.94	32.61	1.66	67.83		

Shaded cells indicate values below the detection limit. The reported value is the sample-specific MDA.

- The detection limit for a given isotope varied for each sample. This is due to the variation in the total sample mass collected. The laboratory was limited by the mass of sample that could efficiently be processed to extract the nuclides of interest. As a result, the laboratory fractionated a relatively consistent aliquot of the total mass submitted to actually perform the analysis. The larger the sample collected and submitted, the smaller the fraction represented by the aliquot. Thus, the detection limit increased (got poorer) as the total mass collected increased. In each case, however, actual field sampling procedure collected a sample from a 100 cm² area until the entire surface veneer had been removed.
- The three samples which indicated the presence of transuranic activity severely skews the surface media samples for transuranics. This skewness likely results in very conservative estimates of the overall residual transuranic activity in the survey unit.

Surface media sample data evaluation statistics are presented for the uranium series, the transuranic series, and the transuranic series excluding samples #263921, #263922, and #263924 in Figures 3-4, 3-5, and 3-6, respectively. Table 3-13 presents the summary statistics for the surface media sample data set, with the transuranic and uranium series nuclides presented as independent subsets. For information purposes, the transuranic series data summary statistics have been presented with and without samples #263921, #263922, and #263924 collected at locations IVP0000275, 276, and 278.

Table 3-13. Summary Statistics, Surface Media Samples

Statistic	Transuranic Surface Activity Value		Uranium Series Surface Activity Value
	Samples 263921, 263922, and 263924 Included	Samples 263921, 263922, and 263924 excluded	
Number of Measurements	24	21	24
Arithmetic Mean	8.68	1.90	48.51
Standard Deviation	27.10	1.32	14.36
Coefficient of Variation	3.12	0.69	0.30
Max	134.13	6.58	86.30
Median	1.52	1.43	44.59
Minimum	0.75	0.75	29.47
Range	133.38	5.83	56.83
Geometric Mean	2.39	1.64	46.72
UCL (log-normal "t", a=0.05)	7.94	2.37	54.46

DATA EVALUATION STATISTICS

Data Description
 Uranium Series Activity, Surface Media Samples
 Building 779 Cluster, Independent Verification Project
 Building 779, Main Building, Survey Unit 779-21

DCGL 5000

Sample Data	
UNITS - dpm/100 cm ²	
29.47	
33.33	
34.48	
37.13	
37.30	
37.85	
38.13	
38.30	
40.08	
41.86	
41.94	
44.58	
44.60	
47.28	
47.61	
49.72	
50.53	
55.64	
56.29	
62.48	
64.84	
67.83	
76.77	
86.30	

Descriptive Statistics	
Number of Samples	24.000
Mean	48.514
Median	44.590
Standard Deviation	14.357
CV	0.295933
Range	56.830
Minimum	29.470
Maximum	86.300
GM	46.720
GSD	1.315
Mean of LN(Data)	3.844
SD of LN(Data)	0.274
Percent > DCGL	0.000

Normal Statistics	
Mean	48.514
UCL(Mean) - Z	54.258
LCL(Mean) - Z	42.770
95%ile - Z	72.131
Percent > DCGL	0.000
W Test (Data)	0.902431
Normal (a=0.05)?	No

Lognormal Statistics	
GM	46.720
GSD	1.315
AM of data	48.514
AM - MVUE	48.431
AM - MLE	48.509
UCL - Norm t stats	54.577
LCL - Norm t stats	42.452
UCL LogNorm t	54.483
LCL LogNorm t	43.206
UCL - Modified Cox	54.497
LCL - Modified Cox	43.040
UCL - "Exact"	
LCL - "Exact"	
95%ile	73.344
UTL 95%, 95%	87.988
Percent > DCGL	0.000
PEP (Upper)	
PEP (Lower)	
W Test (In Data)	0.960795
Lognorm (a=0.05)?	Yes

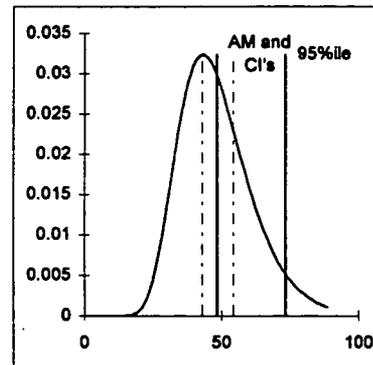
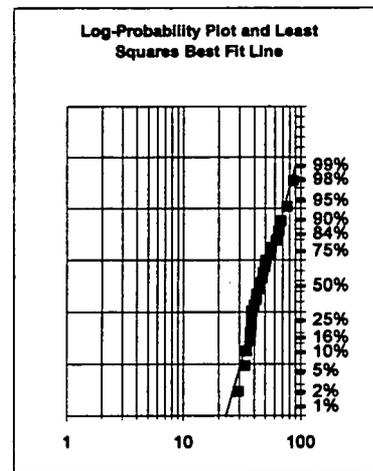
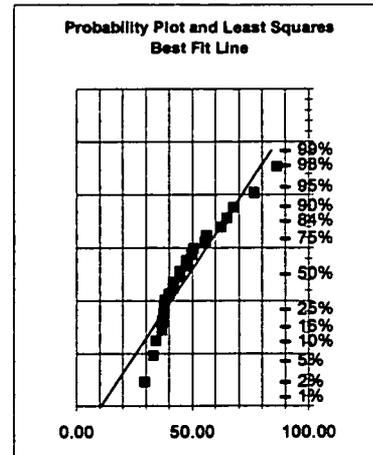


Figure 3-4. Data Evaluation Statistics—Uranium Series Activity, Surface Media Samples

41

DATA EVALUATION STATISTICS

Data Description
 Transuranic Activity, Surface Media Samples
 Building 779 Cluster, Independent Verification Project
 Building 779, Main Building, Survey Unit 779-35

DCGL 100

Sample Data
UNITS - dpm/100 cm ²
0.75
1.00
1.02
1.07
1.07
1.12
1.21
1.37
1.37
1.39
1.43
1.51
1.53
1.66
1.87
2.00
2.07
3.16
3.22
3.56
6.58
14.49
19.64
134.13

Descriptive Statistics	
Number of Samples	24.000
Mean	8.676
Median	1.520
Standard Deviation	27.100
CV	3.123569
Range	133.380
Minimum	0.750
Maximum	134.130
GM	2.389
GSD	3.268
Mean of LN(Data)	0.871
SD of LN(Data)	1.184
Percent > DCGL	4.167

Normal Statistics	
Mean	8.676
UCL(Mean) - Z	19.518
LCL(Mean) - Z	-2.166
95%ile - Z	53.255
Percent > DCGL	0.038
W Test (Data)	0.302545
Normal (a=0.05)?	No

Lognormal Statistics	
GM	2.389
GSD	3.268
AM of data	8.676
AM - MVUE	4.599
AM - MLE	4.816
UCL - Norm t stats	20.119
LCL - Norm t stats	-2.767
UCL LogNorm t	7.940
LCL LogNorm t	2.921
UCL - Modified Cox	8.879
LCL - Modified Cox	2.382
UCL - "Exact"	
LCL - "Exact"	
95%ile	16.755
UTL 95%, 95%	36.778
Percent > DCGL	0.081
PEP (Upper)	0.746
PEP (Lower)	0.001317
W Test (ln Data)	0.746877
Lognorm (a=0.05)?	No

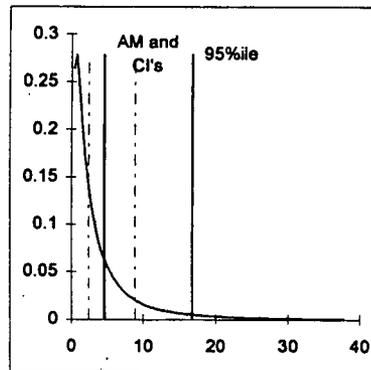
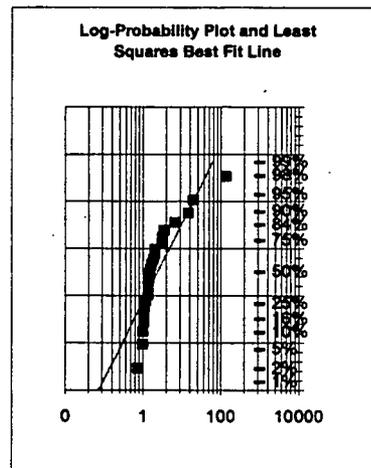
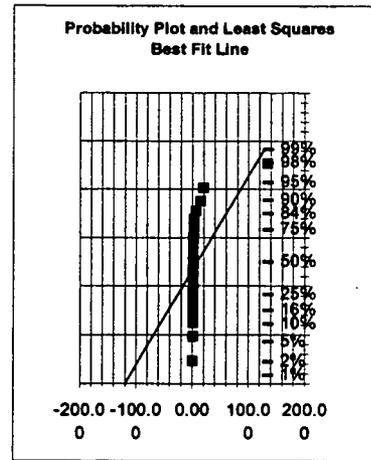


Figure 3-5. Data Evaluation Statistics—Transuranic Activity, Surface Media Samples

42

DATA EVALUATION STATISTICS

Data Description

Transuranic Activity, Surface Media Samples (without samples MED0000275, 276 and 278)
 Building 779 Cluster, Independent Verification Project
 Building 779, Main Building, Survey Unit 779-35

DCGL 100

Sample Data	
UNITS - dpm/100 cm ²	
0.75	
1.00	
1.02	
1.07	
1.07	
1.12	
1.21	
1.37	
1.37	
1.39	
1.43	
1.51	
1.53	
1.66	
1.87	
2.00	
2.07	
3.16	
3.22	
3.56	
6.58	

Descriptive Statistics	
Number of Samples	21.000
Mean	1.803
Median	1.430
Standard Deviation	1.319
CV	0.693079
Range	5.830
Minimum	0.750
Maximum	6.580
GM	1.637
GSD	1.676
Mean of LN(Data)	0.493
SD of LN(Data)	0.516
Percent > DCGL	0.000

Normal Statistics	
Mean	1.803
UCL(Mean) - Z	2.467
LCL(Mean) - Z	1.339
95%ile - Z	4.072
Percent > DCGL	0.000
W Test (Data)	0.700394
Normal (a=0.05)?	No

Lognormal Statistics	
GM	1.637
GSD	1.676
AM of data	1.803
AM - MVUE	1.858
AM - MLE	1.871
UCL - Norm t stats	2.503
LCL - Norm t stats	1.303
UCL LogNorm t	2.367
LCL LogNorm t	1.479
UCL - Modified Cox	2.388
LCL - Modified Cox	1.445
UCL - "Exact"	
LCL - "Exact"	
95%ile	3.829
UTL 95%, 95%	5.571
Percent > DCGL	0.000
PEP (Upper)	0.000
PEP (Lower)	0
W Test (ln Data)	0.9116
Lognorm (a=0.05)?	Yes

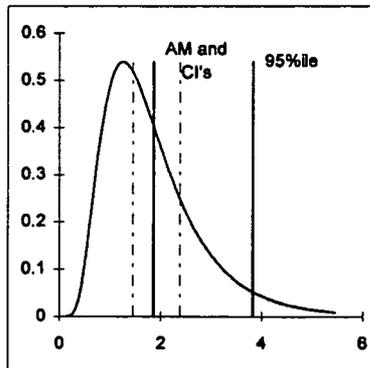
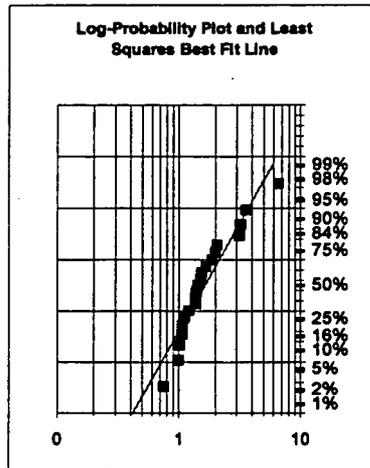
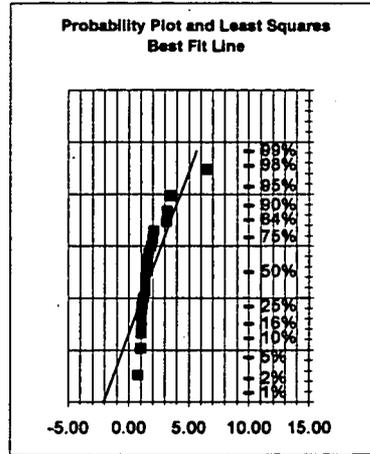


Figure 3-6. Data Evaluation Statistics—Transuranic Activity, Surface Media Samples (without samples MED0000275, 276, and 278)

4.0 Analysis of Sample Plan Results for Compliance

In accordance with MARSSIM and other EPA guidance (EPA 1997) (EPA 1993), the Building 779 Cluster IV SAP identified the decision rules which provide the basis for independently verifying and assessing the RFETS Contractor's conclusions and recommendations for risk management actions in Building 779 (DOE 1999a). To accomplish this objective, the IVC was tasked with performing independent measurements of a representative fraction of the Contractor's survey, such that a statistically valid, yet independent conclusion could be drawn. In order to obtain a data set robust enough to allow statistically valid comparisons with the decision rules, the IVC selected and sampled one of the 17 designated interior survey units in the Main Building. The first decision rule supports this decision objective. The IVC was also tasked with reviewing and verifying the Contractor's Closeout Radiological Survey Report and its conclusions. Since the Contractor's decision basis is applied independently to each survey unit, a sampling and statistical test with power comparable to that used by the Contractor was needed in order to compare with the conclusions reached by the Contractor. The second decision rule supports this objective. The decision rules which define compliance for the independent verification of the Building 779 Cluster surveys are specified in the IV SAP (DOE 1999a) and were reviewed by the EPA and approved by DOE and CDPHE. The IVC's SAP specifies the following two decision rules:

If the independent verification survey concludes that, in the selected survey unit(s), the mean (or median) removable surface contamination concentration is below 20 dpm/100 cm² gross alpha activity, and the mean (or median) total alpha surface contamination concentration as measured by direct surface emission is below 100 dpm/100 cm², and the maximum total alpha surface contamination concentration as measured by direct surface emission is below 300 dpm/100 cm², and the mean (or median) contamination concentration on and beneath a surface with a surface coating as measured by collection and analysis of a surface media sample is below 100 dpm/100 cm² for all transuranic nuclides combined and below 5,000 dpm/100 cm² for all uranium series nuclides combined, then conclude that the survey unit meets the release criterion.

If the IVC survey conclusion disagrees with the Contractor's final status survey conclusion, then refute the Contractor's conclusion for the survey unit and consult with the DOE-RFFO contact for direction on discrepancy resolution.

Demonstrating compliance with the decision rules for independent verification provides DOE with assurance that a substantial and credible case exists for releasing the buildings from further radioactive contamination controls during demolition or disposal.

The first decision rule forms the basis for the five DCGLs, the benchmarks against which measured values are compared to determine compliance. Each component of the decision rule can be reduced to a specific DCGL. The DCGLs for the Main Building Closeout Radiological Survey are:

- 20 dpm/100 cm² for removable alpha surface contamination
- 100 dpm/100 cm² (mean or median) total alpha surface contamination as measured by direct surface emission

- 300 dpm/100 cm² (maximum) total alpha surface contamination as measured by direct surface emission
- 100 dpm/100 cm² (mean or median) total transuranic surface contamination on and beneath a surface with a surface coating as measured by collection and analysis of a surface media sample
- 5,000 dpm/100 cm² (mean or median) total uranium series surface contamination on and beneath a surface with a surface coating as measured by collection and analysis of a surface media sample

4.1 Survey and Sampling Results Compared to the DCGLs

The following sections address each component of the sampling performed and compare the results to the applicable DCGLs. While each data set collected by the IVC has been shown to best fit a normal distribution, the DCGL_w values, as stated by the RFETS Contractor (RMRS 1999a), do not specify whether the compliance benchmark assumes the arithmetic mean or some other estimate of central tendency appropriate to the distribution. For example, in the case of normally distributed data, the normal average (i.e., arithmetic mean) is a more appropriate indicator of the central tendency. When the distribution is not well known or abnormally skewed, the median value generally provides a good estimate of the central tendency for the data set. For comparison purposes in this report, the arithmetic (or normal) mean, the log-normal mean, and the median value are provided for each data set along with the maximum values observed. These provide the risk managers and decision maker with the range of plausible values that might be encountered and considerable evidence, regardless of the underlying distribution, for comparison with the DCGL benchmarks.

4.1.1 Direct Static Surface Measurements

Table 4-1 presents the gross direct static surface measurement results obtained in the survey unit selected for independent verification in survey unit 779-35. In this table, no correction for instrument background has been made in order to provide the risk managers and decision makers with the information needed to compare corrected and uncorrected results in the survey unit and correlate the measured residual radioactivity in the survey unit not only with the DCGL but also with the comparable measure of background.

Table 4-1. Comparison of Direct Static Survey Measurements to Applicable DCGLs

Main Building, Survey Unit 779-35 Unadjusted (Gross) Measurements (dpm/100 cm ²)						
DCGL Value (Total Surface Contamination by direct surface emission)	Arithmetic Mean	Lognormal Geometric Mean	Median	Arithmetic UCL ₉₅	Lognormal UCL ₉₅	Maximum
100 dpm/100 cm ²	12.7	11.4	13.2	14.7	15.8	
300 dpm/100 cm ²						20.5

45

Table 4-2 compares the background adjusted survey unit measurement results to the applicable DCGL. The background adjustment for direct static measurements is made by simply subtracting the central tendency estimate of the background measurements made over the sampling period from the comparable central tendency estimate of the gross, or unadjusted values collected and recorded in the field (see Section 3.2 for detailed discussion of background correction methods employed).

Table 4-2. Comparison of Background Adjusted Direct Static Survey Results to Applicable DCGLs

Main Building, Survey Unit 779-35 Background Adjusted (Net) Measurements ^a (dpm/100 cm ²)						
DCGL Value	Arithmetic Mean	Lognormal Geometric Mean	Median	Arithmetic UCL ₉₅	Lognormal UCL ₉₅	Maximum
100 dpm/100 cm ² Total Surface Contamination by direct surface emission ²	-2.4 ^b	-2.7 ^b	-1.3 ^b	-2.4 ^b	-2.2 ^b	
300 dpm/100 cm ² Total Surface Contamination by direct surface emission ²						-4.3 ^b
^a Background corrected values are provided for information. They are not distinguishable with statistical significance from background. ^b The following background values were used to adjust the direct static measurement values: Arithmetic Mean = 15.1 Lognormal Geometric Mean = 14.1 Median = 14.5 Arithmetic UCL = 17.1 Lognormal UCL = 18.0 Maximum = 24.8						

From the above data, it is evident that the surface contamination as measured by direct surface emission from the building surfaces in survey unit 779-35 is well below the DCGL_w. The IVC did not employ a scanning survey method in the independent verification sampling plan. Rather, the IVC has evaluated the scanning data collected by the Contractor to determine if the data supports the conclusions reached by the Contractor with respect to the DCGL_{EMC}. However, it is interesting to note the maximum concentration measured using direct static methods as it compares to the DCGL_{EMC}. The maximum value measured in survey unit 779-35 is substantially below the DCGL_{EMC} and the background adjusted mean concentration is essentially zero. The independent verification data cannot exclude the possibility that localized concentrations of surface contamination might exist above the DCGL_{EMC} value. But, given the number of measurements made, knowledge about the nature of the distribution of the data, and the large differences between the data metrics and the DCGL_{EMC}, it can be inferred that the likelihood of encountering even moderately sized areas with concentrations exceeding the DCGL_{EMC} is extremely small.

4.1.2 Smear Samples for Removable Surface Contamination

Smear samples are not subject to the influence of background radiation at the site, but the radiation counting instruments used to assay these samples are subject to background radiation levels at the counting laboratory and have inherent instrument backgrounds which are corrected by the laboratory processing the samples. Since the background corrections performed are not relevant to the conditions encountered in the Main Building, only the background adjusted values

are provided here in Table 4-3. The raw counting data can be referenced in the analytical laboratory report for the smear samples contained in Appendix C.

Table 4-3. Comparison of Smear Sample Results to Applicable DCGL_w.

Main Building, Survey Unit 779-35 Smear Sample Results (dpm/100 cm ²)						
DCGL Value	Arithmetic Mean	Lognormal Geometric Mean	Median	Arithmetic UCL ₉₅	Lognormal UCL ₉₅	Maximum
20 dpm/100 cm ² Removable Surface Contamination	<4.73 ^a	<4.73 ^a	<4.73 ^a	NA	NA	<4.73 ^a
^a All 29 smear samples yielded total alpha activity below the detection limit for the analysis. The method detection limit is presented for comparative information.						

From the above data, it is evident that the removable surface contamination, as measured by smear sampling of the surfaces in survey unit 779-35, is well below the DCGL.

4.1.3 Surface Media Samples

As with smear samples, surface media samples are not subject to the influence of background radiation at the site, but have been corrected for the background present at the laboratory by the laboratory processing the samples. Again, since the background corrections performed are not relevant to the conditions encountered in the Main Building, only the background adjusted values are provided here in Table 4-4. The raw counting data can be referenced in the analytical laboratory report for the smear samples contained in Appendix C.

Table 4-4. Comparison of Surface Media Sample Results to Applicable DCGLs

Main Building, Survey Unit 779-35 Surface Media Sample Results (dpm/100 cm ²)						
DCGL Value	Arithmetic Mean	Lognormal Geometric Mean	Median	Arithmetic UCL ₉₅	Lognormal UCL ₉₅	Maximum
100 dpm/100 cm ² Total Transuranic Activity by surface media sample	8.7	2.4	1.5	20.1	7.9	134
5,000 dpm/100 cm ² Total Uranium Series Activity by surface media sample	48.5	46.7	44.6	54.6	54.5	86.3

From the above data, it is notable that the mean total transuranic activity contained on and in a thin veneer beneath the surface sampled is significantly less than the allowable mean value even though one sample exceeded this value. For a Class I survey unit, this was not necessarily unexpected and shows that the building is not utterly free of added radioactivity. The surface media sample measurement that exceeded the mean value is addressed in Section 7.2.

Most of the samples measured for transuranic activity resulted in measured concentrations below the method detection limit for the analysis. Much of the transuranic activity reported is attributed to americium-241 (Am-241) owing to interference in the energy window for Am-241 rather than

americium activity. (See Appendix C for the method blank data indicating the activity showing up as Am-241 even when no americium is present.)

The total uranium series activity was consistently measured at concentrations exceeding the method detection limit even though the concentrations measured were consistently well below the applicable DCGL. The presence of detectable concentrations of uranium series nuclides does not, however, necessarily indicate that the activity is DOE contributed activity. In fact, isotopic ratios present in the samples support the position that the uranium series activity is naturally occurring radioactivity present in the construction materials from which the building was made. Nonetheless, because a decision was made during sampling plan design to avoid the need to make reference survey unit comparisons in order to statistically verify this assumption, all of this activity is herein assumed to be DOE contributed and is compared directly to the applicable DCGL. Even with this conservative assumption, it is clear that the residual uranium series activity on and in a thin veneer beneath the surface sampled is well below the DCGL.

4.2 Summary of Field Sampling Data

As evidenced above, each metric—the arithmetic average, logarithmic average, their respective 95 percent upper confidence limit (UCL_{95}) estimates, and the median value—is well below the applicable $DCGL_W$ concentration value. Moreover, the maximum value for each data set is well below the applicable $DCGL_{EMC}$. Based on the direct static measurements, removable smears sample results, and surface media sample results collected in the survey unit selected for independent verification of the Main Building (779-35), there is no evidence of radiological surface contamination levels exceeding the selected DCGLs.

Thus, the first of the tests of the DQO decision rule—the *residual radioactivity must not exceed the applicable DCGLs*—has been verified.

End of current text

5.0 Graphic Presentations of the Survey and Sampling Results

Graphics are a powerful and valuable tool used in reviewing the data collected. Graphic presentations—Normal Probability, Log Probability, and Probability Density Function Plots—have already been provided in Section 3.0 in support of the determination of the underlying distribution of each data set. In addition to these graphical treatments of each of the data sets collected, additional pictorial presentations are provided in Section 6.0 to assist the risk manager and decision maker in evaluating the data. Each form of graphic presentation provides a unique perspective or advantage in the data evaluation process.

5.1 Posting Plots—Spatial Contamination Distribution Graphics

Posting plots are presented for visualizing the spatial contaminant distribution within the survey unit sampled and surveyed by the IVC. Trends in spatial distribution become evident when data is plotted in this manner. The results of each data set, normalized to units of $\text{dpm}/100 \text{ cm}^2$, are superimposed over the building surfaces. The walls and ceilings in the building are “unfolded” to form a contiguous surface segment, as when a cardboard box is unfolded and laid flat. Three posting plots are provided. One plot, (Figure 5-1) displays the 29 direct static surface contamination measurements made in survey unit 779-35. The data used to generate this posting plot are “gross” measurements (not corrected for the mean background of $15.1 \text{ dpm}/100 \text{ cm}^2$) to avoid negative numbers. Figures 5-2 and 5-3 display the 24 surface media sample results for transuranic and uranium series activities, respectively.

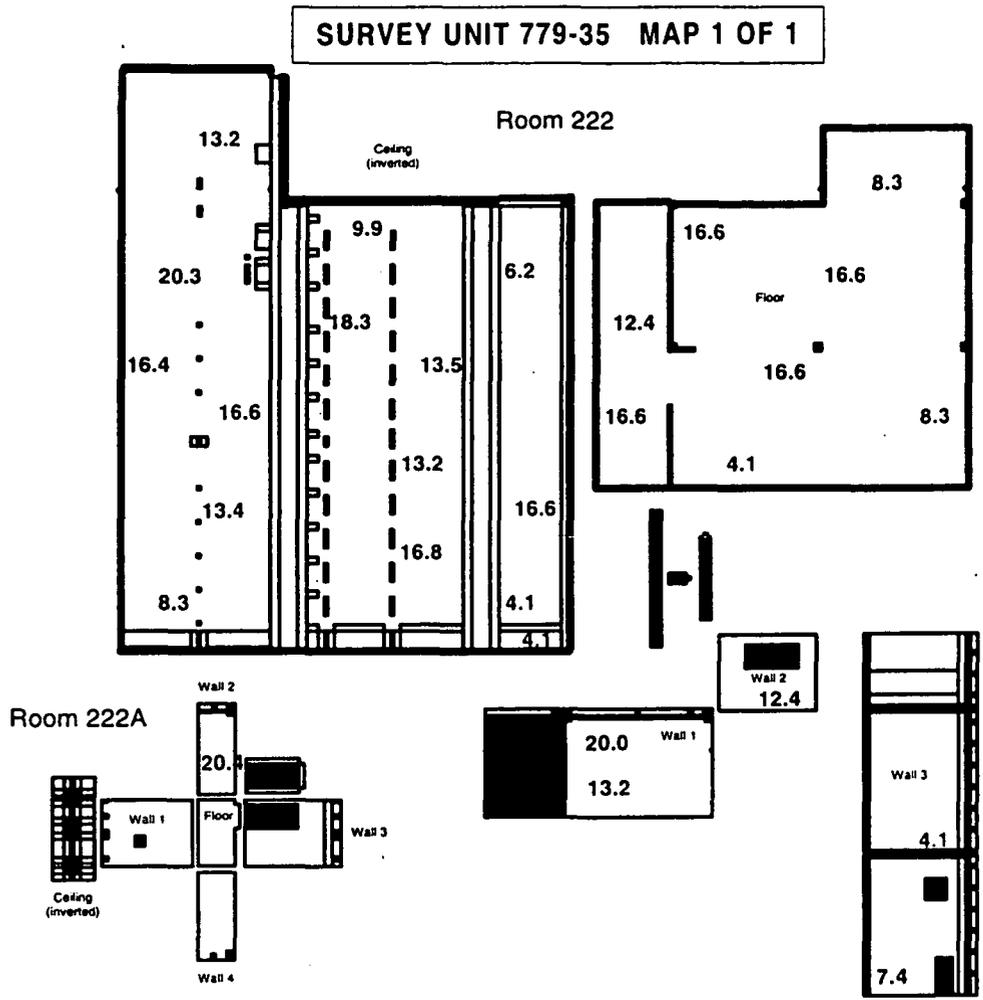
With one exception (the surface media sample for transuranic activity from location IVP0000276), the posting plots confirm that no substantial spatial trends in residual activity are present.

5.2 Histograms—Concentration Distribution Graphics

One of the oldest methods used for analyzing data set distributions is the histogram (or frequency plot). The data are divided into units, or bins, representing increments of activity. The data set is then sorted into these bins and the number of data points occurring in each bin (the frequency) is counted and then plotted using a bar graph. This presentation is designed to provide for visual means of assessing the symmetry and variability of the data set. When constructed correctly, the histogram will indicate if the data are skewed and will show the direction of skewness (EPA 1998). Figures 5-4, 5-5, 5-6, 5-7, and 5-8 display the histograms (technically frequency plots) for the background, direct static surface measurement, post-surface media sampling direct static surface measurement, surface media samples for transuranics, and surface media samples for uranium data sets, respectively.

**INDEPENDENT VERIFICATION FOR THE BUILDING 779 CLUSTER
SURVEY UNIT SAMPLE PLAN**

Posting Plot: Direct Static Measurements



All values "gross" activity in units of dpm/100 cm²

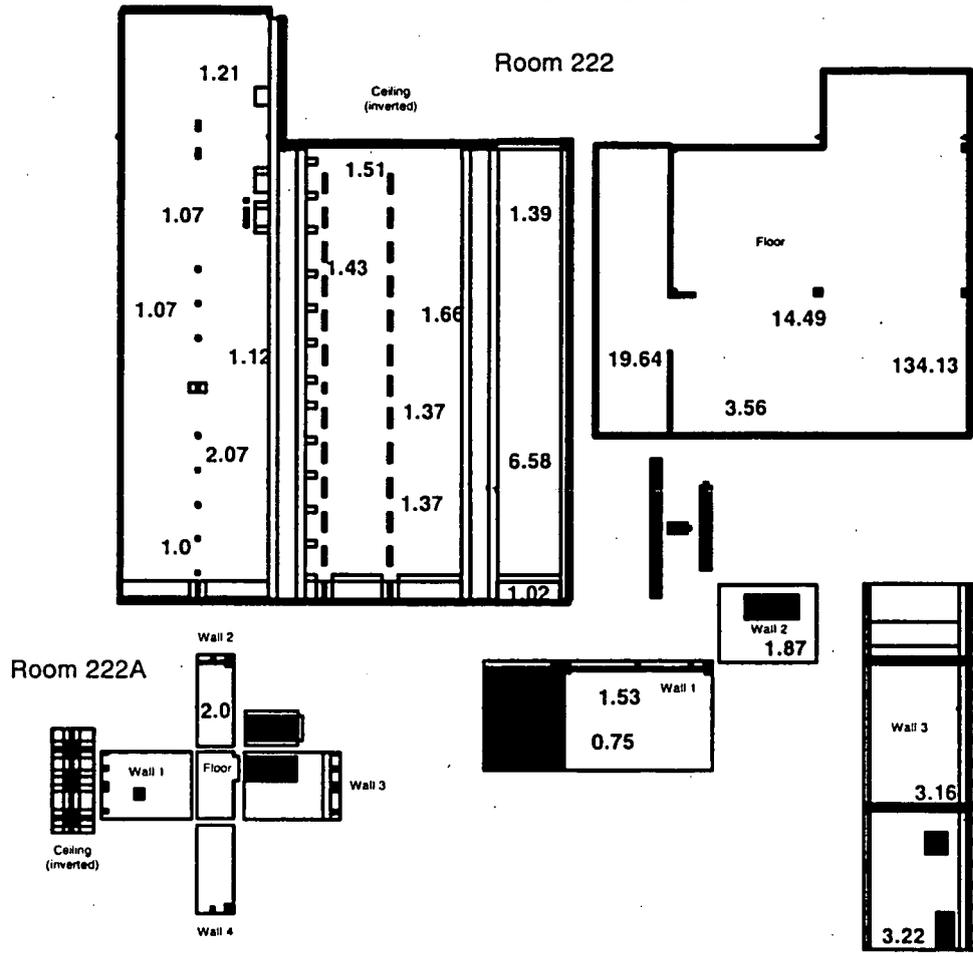
Figure 5-1. Posting Plot—Direct Static Surface Contamination Measurements

51

**INDEPENDENT VERIFICATION FOR THE BUILDING 779 CLUSTER
SURVEY UNIT SAMPLE PLAN**

Posting Plot: Surface Media Samples, Transuranic

SURVEY UNIT 779-35 MAP 1 OF 1



All values "gross" activity in units of dpm/100 cm²

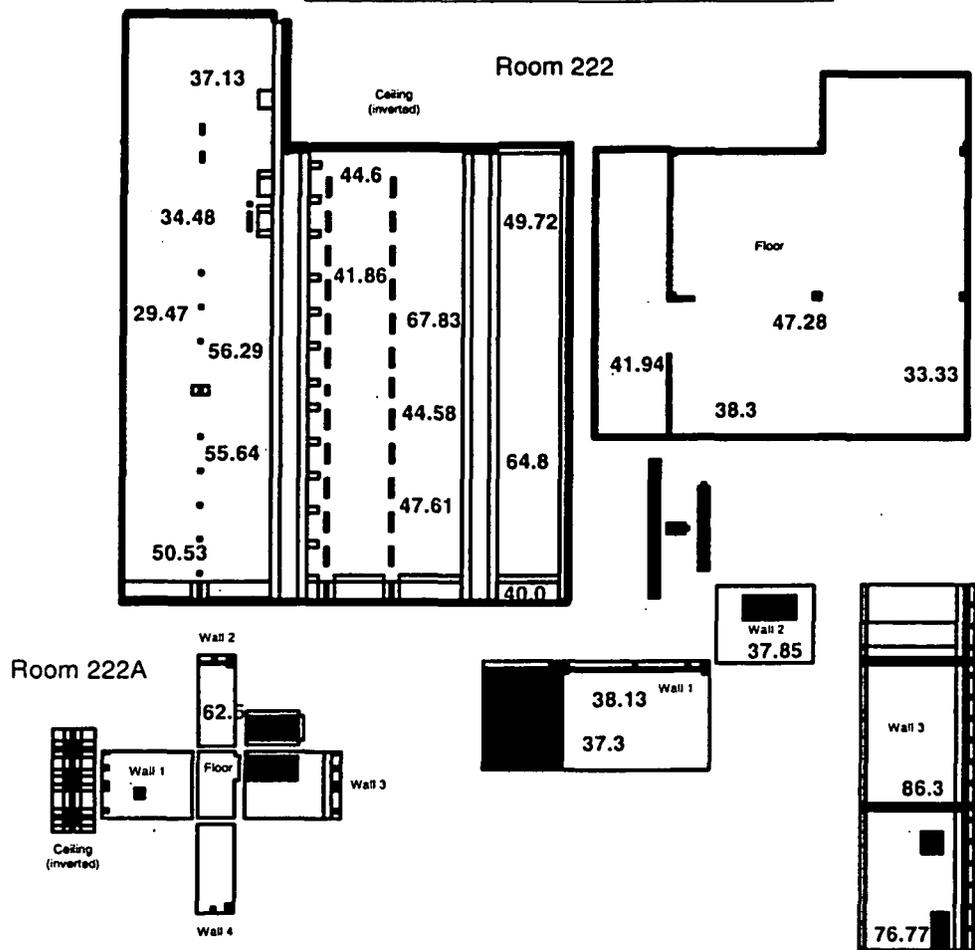
Figure 5-2. Posting Plot—Surface Media Samples, Transuranic Activity

52

**INDEPENDENT VERIFICATION FOR THE BUILDING 779 CLUSTER
SURVEY UNIT SAMPLE PLAN**

Posting Plot: Surface Media Samples, Uranium

SURVEY UNIT 779-35 MAP 1 OF 1



All values "gross" activity in units of dpm/100 cm²

Figure 5-3. Posting Plot—Surface Media Samples, Uranium Series Activity

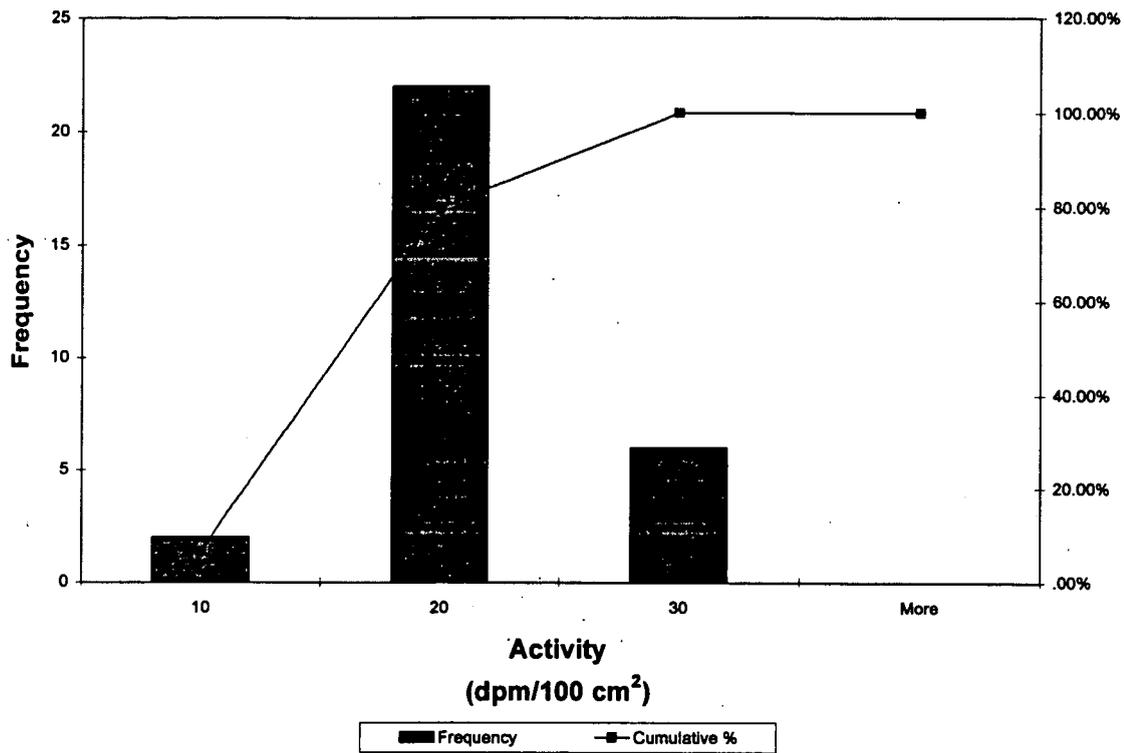


Figure 5-4. Histogram—Instrument Background Measurements

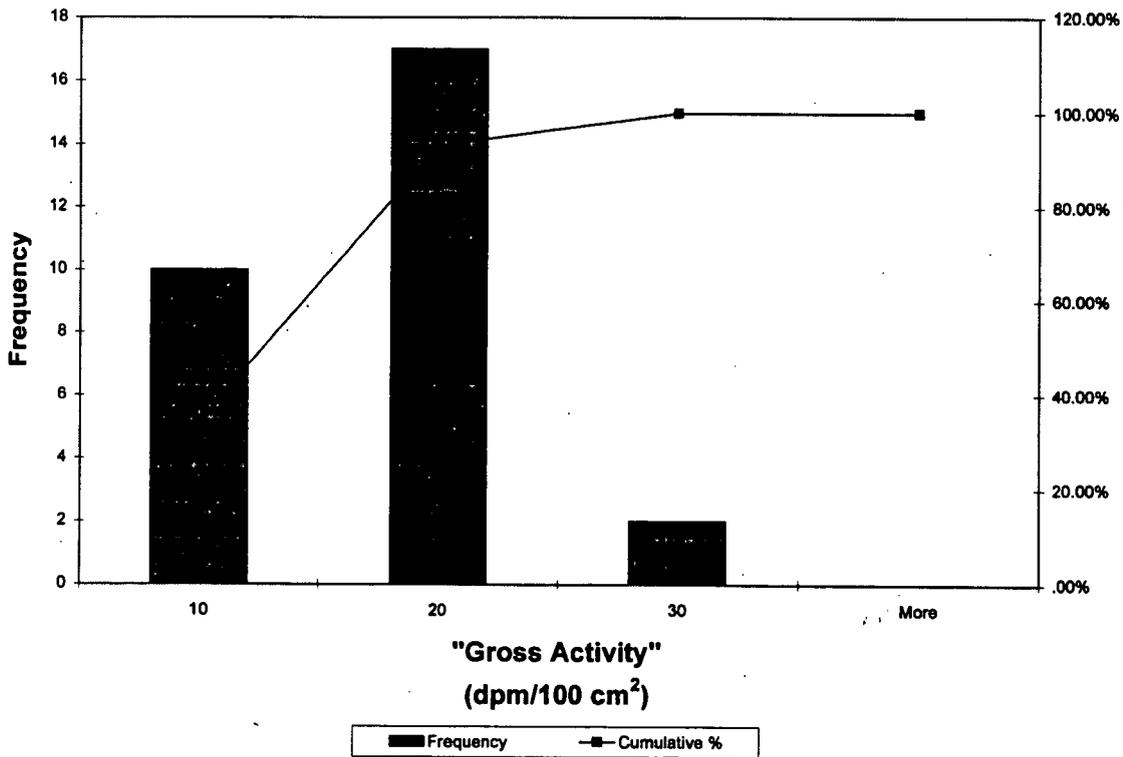


Figure 5-5. Histogram—Direct Static Surface Contamination Measurements

54

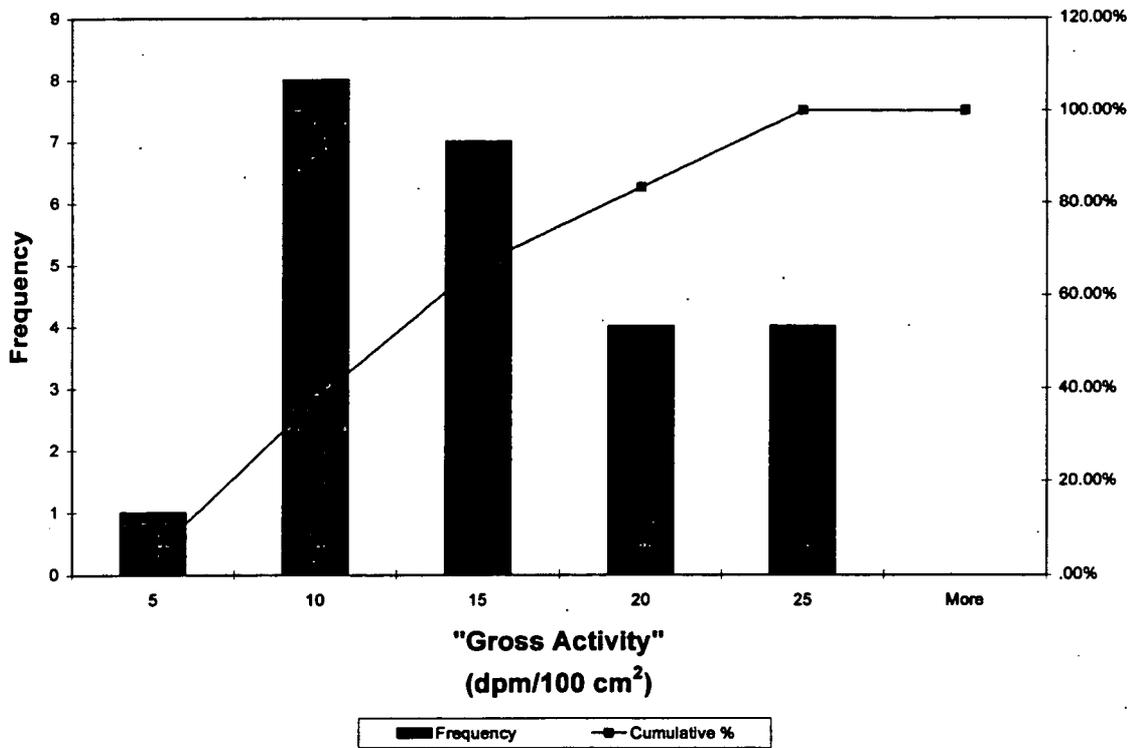


Figure 5-6. Histogram—Post-Surface Media Sampling Direct Static Surface Measurements

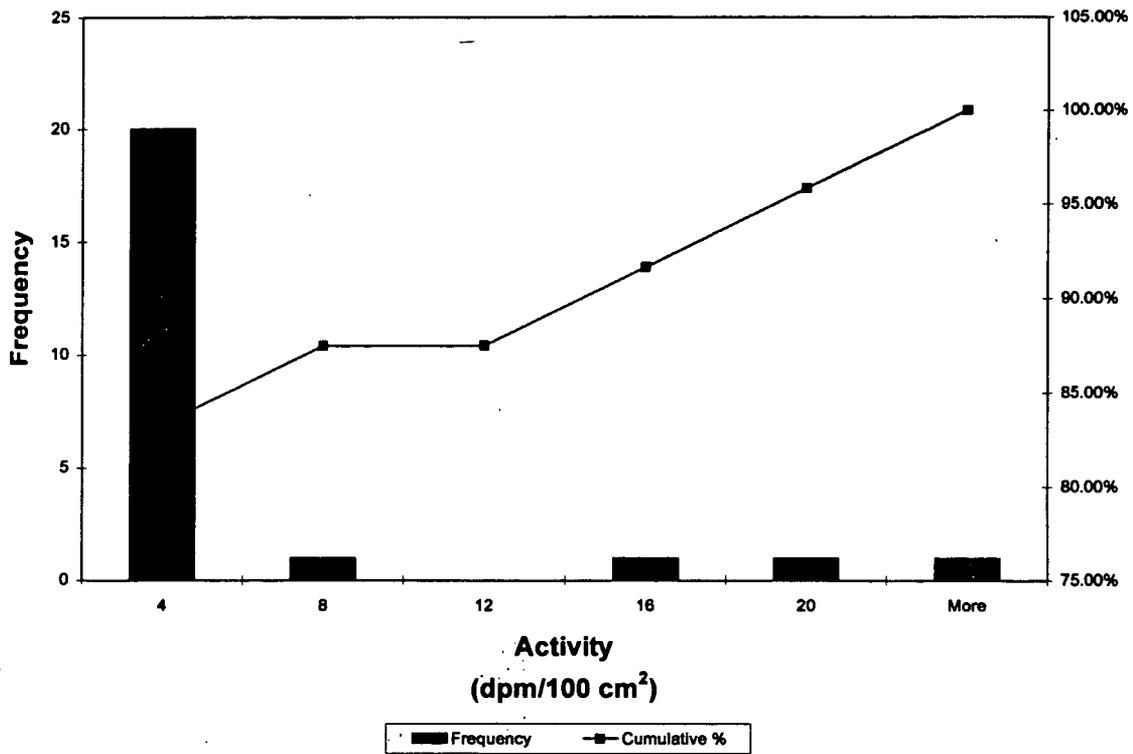


Figure 5-7. Histogram—Surface Media Samples, Transuranic Activity

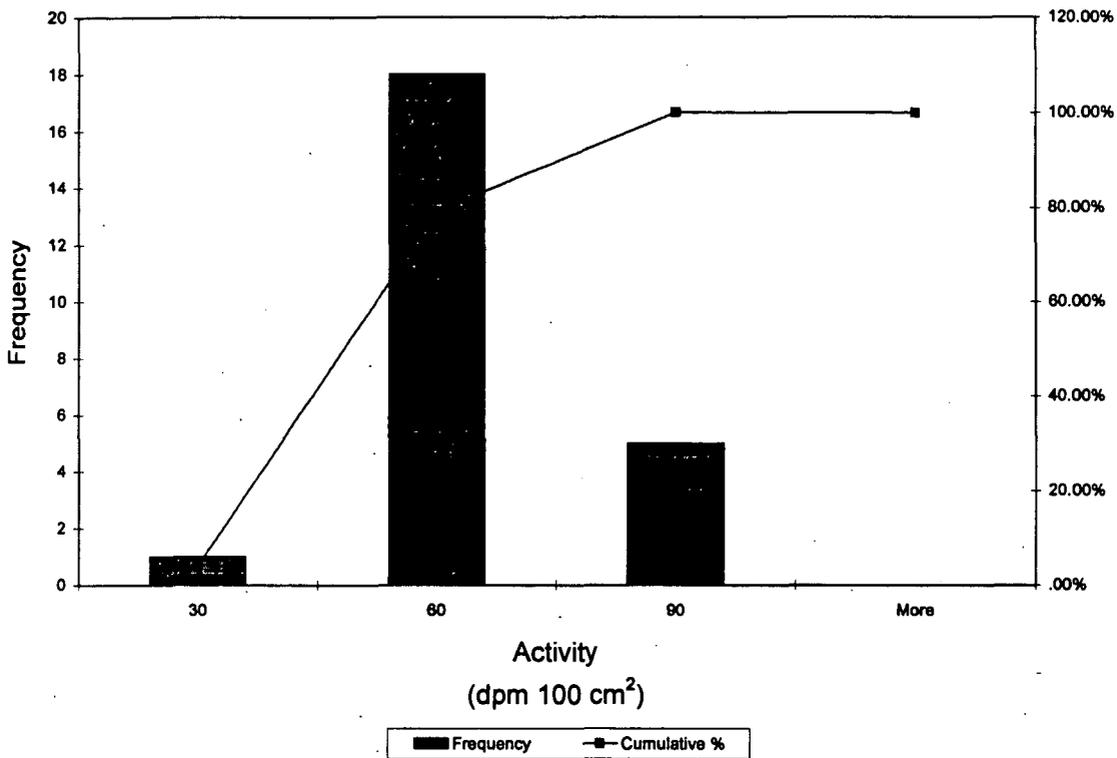


Figure 5-8. Histogram—Surface Media Samples, Uranium Series Activity

Each of the histogram plots provides evidence of relatively symmetric or left shifted skewness in the data set with most data clustered around a non-discrete central concentration which is substantially below the applicable DCGL. This symmetric tendency supports the conclusion that the data distributions are best estimated by the normal distribution.

5.3 High-Low Graphs—Data Variability Graphics

A key element in the evaluation of the sampling and survey data is the variation within the data set. As the data variability increases, the ability of the risk manager to confidently make decisions about true state of radiological contamination in the survey unit or building in relation to the applicable DCGL and null hypothesis decreases. When variability is small (or excessively large) relative to the difference between the mean and the DCGL, the risk manager can be confident in the decisions made using the data set provided. When evaluating data variability, it is important to know, first, that the data set contains a sufficiently large sample population (number of measurements). Retrospective power curves, demonstrating the “power” of the sign test to reject the null hypothesis with the actual sample size collected, are presented in Section 8.0. High-Low graphs are simple presentations showing the range between the upper and lower 95 percent confidence intervals about the central tendency (geometric or arithmetic mean). Figures 5-9, 5-10, and 5-11 depict the variability observed in each type of data analyzed.

56

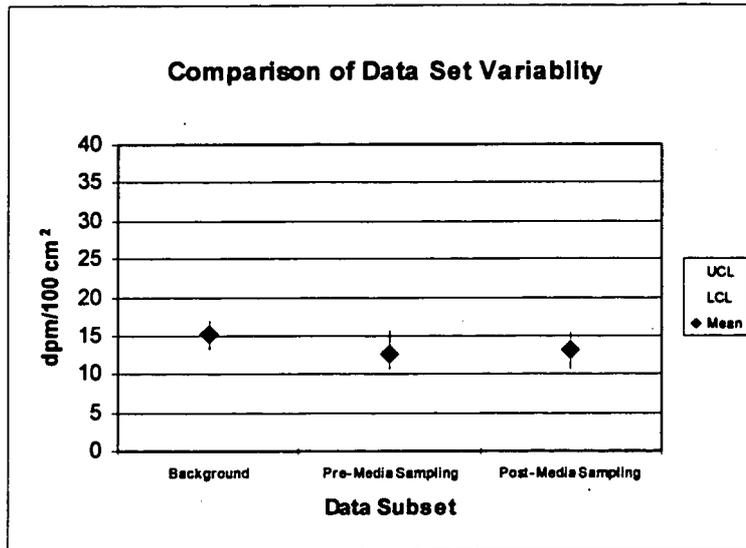


Figure 5-9. High-Low Graphs—Direct Static Surface Measurements

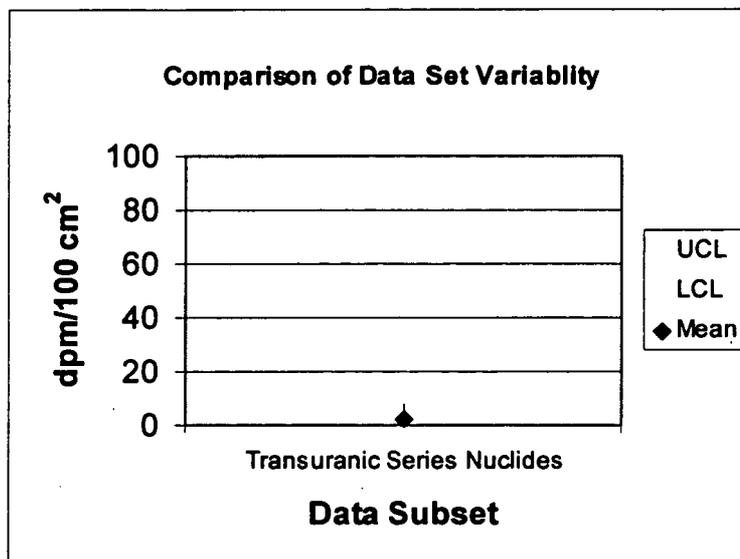


Figure 5-10. High-Low Graphs—Surface Media Samples, Transuranic Activity

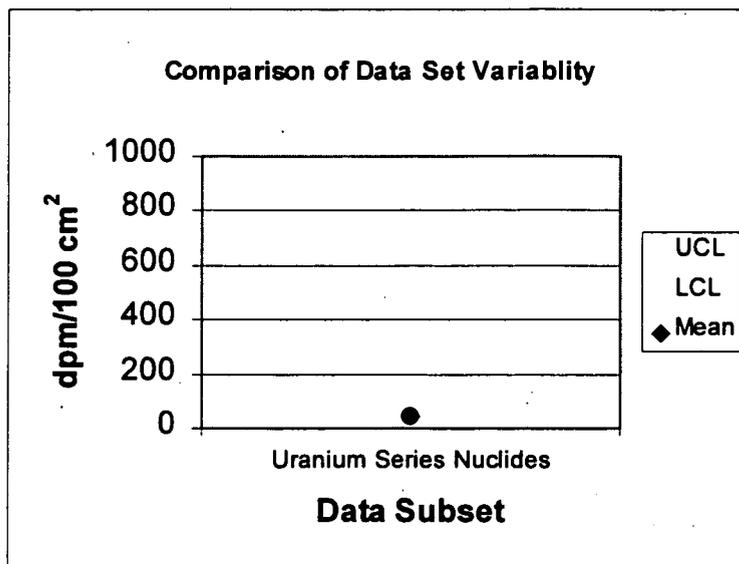


Figure 5-11. High-Low Graphs—Surface Media Samples, Uranium Series Activity

The pattern of comparatively low central tendencies, and small measure of data variability in each of the data sets presented, provide substantial evidence that the estimates of the true mean residual radioactive concentrations presented are below the DCGLs. No DCGL is included in the 95 percent confidence intervals about the mean. The lack of significant variability in any of the data sets is also indicative of a lack of discretely distributed activity (supporting the conclusions of the posting plots above) and excellent precision in the analytical methods employed in the sampling and measurements processes. By presenting the three data sets made with the same instruments and procedures (background, direct static measurements, and post-surface media sampling direct static measurements), it is also evident that they report essentially equivalent measures of activity. In other words, the best estimates of surface activity as measured by direct surface emission are statistically indistinguishable from background.

Other visual presentations of the data are possible and may have been indicated if the data sets available were less robust than they actually are. However, the graphic treatment of the data presented here and in other sections is sufficient to enable the risk managers and decision maker to make confident determinations respecting the data.

End of current text

6.0 Quality Control Sampling Results and Analysis

An important aspect of any sampling plan is the effort made to assure the quality of data collected. The independent verification process as a whole is a QA method in itself. Thus, it was critical to assure the quality of all of the independent verification data through quality checks and controls, calibrations, training, and qualification of laboratories and services used. The objective of independent verification for the Building 779 Cluster final status radiological surveys added an element of QA to the design of the sampling evolution. In addition to designing quality checks and controls into the independent verification sampling, the IVC provided for QC checks to assess the quality of the Contractor's data.

The IV SAP distinguished these two principle QC objectives in the design of the sampling plan. Stage I QC sampling was designed to assess the quality of the data collected by the Contractor. Stage II QC sampling was designed to assess the quality of the data collected by the IVC. In each case where QC samples were used, either for Stage I or Stage II sampling, the samples were maintained under chain-of-custody control from the time they were prepared until they were introduced to either the Contractor's or IVC's sample batch. Tamper seals and locked storage were employed when samples were not in the physical custody of the IVC's Field Team Leader.

The IV SAP specifies QC sampling to be performed over the duration of the Final Status Survey performance for all survey units in the Building 779 Cluster rather than for each specific building. This report, specific to the Main Building, does not contain every element of QC data planned for the cluster of buildings as a whole. The costs associated with implementing separate QC sampling for each building in the 779 Cluster was determined to be prohibitive and unnecessary. Instead, a cumulative assessment and presentation of QC data will be presented with each successive Independent Verification Report of the Contractor's Final Status Survey.

This section of the report presents the QC data collected and measures employed to assure that quality objectives in the design of the sampling plan were achieved. Section 7.0 assesses the overall data quality against the published or industry accepted data quality indicators.

6.1 Stage I—Independent Quality Control of the Contractor's Sampling

6.1.1 Smear Samples

The IVC provided smear samples to the Contractor for measurement and analysis by the Contractor's selected instrumentation and methods. An unopened package of smear sample media was obtained from the Contractor prior to the start of the independent verification of the Main Building. The IVC assigned a series of these as "blanks" and spiked a second series of smears with three different concentrations of an alpha emitting transuranic nuclide—one which is part of the nuclide mix identified as a contaminant of concern for the 779 Cluster.

The spikes were not certified as containing traceable concentrations of the nuclide added. Thus, the spikes do not provide a measure of accuracy directly. Accuracy is established for the instrument measuring the activity on the smears by the RFETS (or contract laboratory, if used) calibration and analysis procedures. Instead, the spikes serve to provide a comparison between the results achieved by the Contractor and those achieved by the IVC.

The blank smears test the ability of the counting instrument used to distinguish between background and added activity as well as the ability of the counting technician and sample handling process to prevent cross-contamination.

The IVC has introduced 20 blank smears and 21 spiked smears into the Contractor's smear sampling batch during the final status survey of Building 779. The QC samples were packaged and identified exactly as the Contractor's procedure dictated. Because the Contractor used the same technician to collect and analyze the smear samples they collected, it was not possible to present a double blind set of QC samples; he would know when samples other than those he personally collected were introduced. They were presented as a single blind set of QC samples. The Contractor's counting technician was not aware of the objective of the samples, nor the fact that some were blanks and some were spikes.

The blank smears were prepared by wiping a clean, unaffected, and uncontaminated surface. Each was then packaged individually, assigned a unique QC sample number, and physically controlled to ensure custody and integrity. The spiked smears were prepared by pipetting liquid standard concentrations onto a smear filter disc.

Spiked smears were prepared with three different quantities of radioactivity to provide a range of gross alpha radioactivity concentrations over the range expected to be encountered in the Final Status Survey. This range is necessarily small and near zero for a Final Status Survey.

The QC samples provided to the Contractor were measured and reported to the IVC. Table 6-1 provides a crosswalk between the IVC and Contractor assigned sample numbers and presents a summary of the results obtained by the Contractor and the GJO Analytical Laboratory which establishes a cumulative cross comparison as a measure of the relative accuracy of the instruments and methods employed.

From Table 6-1, it is seen that all but one of the 20 blank smears returned results indicating no detectable radioactivity or activity less than the reported MDA. As reported in the IVC Sampling and Survey Report, Building 729 (DOE 1999b), sample #2C was identified by the Contractor as having 4.5 dpm/100 cm².

Each of the 21 spiked smear samples yielded measurable radioactivity. The 21 spiked activities were differentiated from one another in the Contractor's assay. Yet, sample #6C, #13C, and #16C were reported to have activity below the MDA for the method. As reported in the IVC Sampling and Survey Report, Building 729 (DOE 1999b), this might be caused by too short of a counting time (background, sample, or both) to adequately distinguish between background and low-level activity. Smears #6C and #13C were spiked to the lowest concentration of the three and were expected to return the lowest measurement of activity among the three. Likewise, the highest spiked activity returned the highest measurement of activity among the three. Another possible explanation for the lower than expected result on these smear samples is in the method used to prepare the spiked samples. As mentioned earlier, a liquid standard containing an alpha emitting transuranic nuclide was pipetted onto the smear and then allowed to dry. It is likely that a significant fraction of the total activity deposited migrated to a depth in the smear matrix that the activity was attenuated by the sample media itself.

Table 6-1. Results of the Contractor's Assay of QC Smear Samples Provided by the IVC

IVC Sample ID#	Contractor Assigned Sample ID#	Sample Type	Contractor Reported MDA (dpm)	IVC Reported MDA (dpm)	Contractor Reported Results (dpm)	IVC Reported Results (dpm)
NED428	1C	Blank	4.1	^a	0.0	^a
NED429	2C	Blank	4.1	^a	4.5	^a
NED430	3C	Blank	4.1	^a	0.0	^a
NDL431	4C	Blank	10.3	^a	0.3	^a
NED432	5C	Blank	8.5	^a	-0.6	^a
NDL289	6C	Spike	4.1	^a	1.5	^a
NDL290	7C	Spike	8.5	5.3	9.9	24.1
NDL291	8C	Spike	4.1	^a	28.5	^a
NDL292	9C	Spike	8.5	5.4	30.9	54.8
NDL293	10C	Spike	4.1	^a	30.9	^a
NDL294	12C	Spike	10.3	5.5	52.9	96.5
259740	42C	Blank	8.5	4.9	-0.6	1.1
259741	43C	Blank	8.5	4.9	-0.6	0.3
259742	44C	Blank	8.5	4.9	-0.6	0.3
259743	45C	Blank	7.5	4.8	0.9	1.1
259744	46C	Blank	7.5	4.9	0.9	0.3
259745	47C	Blank	7.5	4.9	-0.6	0.3
259746	48C	Blank	7.5	4.9	0.9	0.3
259747	49C	Blank	7.5	4.9	0.9	-0.4
259748	50C	Blank	8.8	4.9	0.0	0.3
259749	66C	Blank	8.8	4.9	0.0	0.3
259750	67C	Blank	8.8	4.9	0.0	0.3
259751	68C	Blank	8.8	4.9	0.0	0.3
259752	69C	Blank	8.8	5.0	1.5	-0.5
259753	70C	Blank	8.8	4.9	1.5	0.3
259754	81C	Blank	8.8	4.9	1.5	1.9
259770	13C	Spike	8.5	4.9	6.9	7.3
259771	14C	Spike	8.5	5.0	12.9	12.0
259772	15C	Spike	7.5	4.9	8.4	12.8
259773	16C	Spike	7.5	5.0	3.9	20.6
259774	17C	Spike	7.5	5.0	12.9	12.8
259775	18C	Spike	8.5	5.0	23.4	31.5
259776	19C	Spike	10.3	5.1	27.3	38.4
259777	20C	Spike	8.8	5.0	19.7	36.9
259778	21C	Spike	8.8	5.0	34.8	32.2
259779	22C	Spike	8.8	5.0	30.3	26.8
259780	28C	Spike	10.3	5.2	73.9	96.8
259781	29C	Spike	10.3	5.2	84.4	96.1
259782	30C	Spike	8.8	5.4	87.9	87.4
259783	26C	Spike	8.8	5.3	75.8	94.5
259784	27C	Spike	8.8	5.3	77.3	76.5

^aSmear samples were disposed of by the Contractor before being counted by the GJO Analytical Laboratory.

The Contractor counted the smears with an Eberline model SAC-4 alpha smear counters (serial #1069, 1406, and 814). The measured background was 0.2, 0.4, and 0.3 cpm respectively. The efficiency was established at 33.3 percent.

6.1.2 Surface Media Samples

A total of 23 Stage I and 18 Stage II surface media QC samples have been analyzed for a cumulative comparison. Surface Media QC samples were made in duplicate (one to be introduced in the Contractor's sample batch and the other in the IVC's sample batch). Before being introduced by either the Contractor or IVC, they are analyzed by the GJO Analytical Laboratory. A comparison of results between the initial count by the GJO Analytical Laboratory, the Contractor's Laboratory, and the GJO Laboratory when the QC sample was recounted when introduced with the IVC sample batch is presented in Table 6-2. The remaining five Stage II surface media samples will be introduced during the IV of the remaining survey units for the 779 Cluster.

Table 6-2. Results of the Contractor's Assay of QC Surface Media Samples Provided by the IVC

Surface Media Sample		Am-241	Pu-238	Pu-239/240	U-234	U-235	U-238
		pCi/g					
GJO Lab ID#	259851	0.01	0.02	0.03	0.56	0.07	0.53
IVC ID#	MED0000213	0.01	0.01	0.02	0.55	0.04	0.56
Contractor ID#	99A9022-019	0.12	^a	0.13	0.68	0.14	0.39
GJO Lab ID#	259852	0.03	0.03	0.02	0.81	0.05	0.77
IVC ID#	MED0000162	0.03	0.02	0.02	0.88	0.06	0.75
Contractor ID#	99A8940-019	0.04	^a	0.05	0.59	0.03	0.80
GJO Lab ID#	259853	0.24	0.01	0.51	2.07	0.09	2.04
IVC ID#	MED0000163	0.29	0.02	0.49	2.26	0.13	2.12
Contractor ID#	99A8940-020	0.28	^a	0.69	1.78	0.19	2.14
GJO Lab ID#	259854	0.30	0.01	0.46	0.71	0.04	0.76
IVC ID#	MED0000214	0.30	0.01	0.35	0.62	0.04	0.66
Contractor ID#	99A9009-020	0.09	^a	0.54	0.41	-0.01	0.38
GJO Lab ID#	259855	0.18	0.04	0.37	0.53	0.04	0.54
IVC ID#	MED0000271	0.20	0.04	0.39	0.36	0.06	0.49
Contractor ID#	99A9009-019	0.28	^a	0.35	0.28	-0.01	0.33
GJO Lab ID#	259856	0.21	0.02	0.34	0.99	0.05	0.86
IVC ID#							
Contractor ID#	99A9460-021	0.20	^a	0.36	0.69	0.02	1.08
GJO Lab ID#	259857	0.31	0.01	0.43	0.99	0.08	0.89
IVC ID#	MED0000200	0.18	0.02	0.33	0.88	0.05	0.90
Contractor ID#	99A9460-022	0.16	^a	0.26	0.80	-0.01	0.76
GJO Lab ID#	259858	0.83	0.02	1.40	1.31	0.08	1.30
IVC ID#	MED0000180	0.78	0.02	1.43	1.56	0.06	1.34
Contractor ID#	99A9460-023	0.63	^a	1.16	1.03	0.09	1.04
GJO Lab ID#	259859	0.82	0.02	1.66	1.40	0.05	1.33
IVC ID#	MED0000189	0.91	0.02	1.70	1.34	0.06	1.34
Contractor ID#	99A9460-024	0.83	^a	1.74	1.56	0.06	1.30

Surface Media Sample		Am-241	Pu-238	Pu-239/240	U-234	U-235	U-238
		pCi/g					
GJO Lab ID#	259860	0.55	0.02	1.23	0.83	0.07	0.68
IVC ID#	MED0000215	1.37	0.02	1.11	0.71	0.04	0.72
Contractor ID#	99A9460-025	0.72	^a	0.92	0.57	-0.01	0.44
GJO Lab ID#	259861	1.12	0.01	2.36	1.02	0.06	1.03
IVC ID#	MED0000164	1.21	0.01	1.97	0.95	0.04	0.95
Contractor ID#	99A9460-026	0.80	^a	2.21	0.67	0.05	0.62
GJO Lab ID#	259862	0.49	0.03	0.78	1.42	0.07	1.18
IVC ID#	MED0000216	0.60	0.03	1.05	1.67	0.11	1.62
Contractor ID#	99A9460-027	0.29	^a	0.53	1.17	0.03	1.05
GJO Lab ID#	259863	1.00	0.08	1.50	0.91	0.10	1.04
IVC ID#	MED0000217	1.33	0.02	2.40	0.83	0.08	0.78
Contractor ID#	99A9460-028	1.08	^a	2.31	0.57	0.02	0.58
GJO Lab ID#	259864	1.71	0.04	3.08	0.58	0.10	0.47
IVC ID#	MED0000165	1.65	0.01	2.99	0.58	0.04	0.56
Contractor ID#	99A9460-029	1.66	^a	3.41	0.52	0.03	0.32
GJO Lab ID#	259865	0.20	0.03	0.66	1.40	0.13	1.03
IVC ID#							
Contractor ID#	99A9460-030	0.76	^a	1.20	0.88	-0.00	0.84
GJO Lab ID#	259866	1.27	0.04	2.60	0.59	0.09	0.38
IVC ID#							
Contractor ID#	99R0317-016	1.10	^a	1.72	0.68	0.06	0.65
GJO Lab ID#	259867	1.15	0.05	2.46	1.63	0.11	1.64
IVC ID#	MED0000272	0.66	0.02	2.08	1.22	0.06	1.16
Contractor ID#	99R0317-017	0.80	^a	2.61	1.52	0.24	1.27
GJO Lab ID#	259868	1.17	0.02	3.28	0.64	0.08	0.64
IVC ID#	MED0000166	0.69	0.02	1.69	0.53	0.04	0.49
Contractor ID#	99R0317-021	6.90	^a	14.2	2.41	0.16	2.30
GJO Lab ID#	259869	3.39	0.04	5.27	0.56	0.07	0.61
IVC ID#							
Contractor ID#	99R0317-022	14.2	^a	22.2	2.50	0.19	2.42
GJO Lab ID#	259870	4.02	0.04	8.59	1.63	0.11	1.60
IVC ID#	MED0000273	7.08	0.02	11.93	1.64	0.07	1.49
Contractor ID#	99R0317-018	0.75	^a	1.32	0.57	0.16	0.75
GJO Lab ID#	259871	8.73	0.05	16.32	2.02	0.09	1.84
IVC ID#							
Contractor ID#	99R0317-019	3.11	^a	6.01	0.45	0.03	0.67
GJO Lab ID#	259872	14.48	0.04	28.93	2.44	0.10	2.28
IVC ID#	MED0000218	7.30	0.01	12.92	1.93	0.11	1.86
Contractor ID#	99R0317-020	5.03	^a	^a	1.41	0.32	1.77

Surface Media Sample		Am-241	Pu-238	Pu-239/240	U-234	U-235	U-238
		pCi/g					
GJO Lab ID#	259873	3.90	0.06	6.62	1.58	0.10	1.65
IVC ID#	MED0000274	3.30	0.01	6.78	1.61	0.45	1.41
Contractor ID#	99A9022-020	5.02	^a	8.28	1.14	0.76	1.83
^a The Contractor did not analyze for this radionuclide.							

6.1.3 Direct Surface Emission Measurements

The Contractor and the IVC chose to utilize the same response check source to test the response of instruments used to make direct surface emission measurements (Table 6-3). This enabled the comparison of routine instrument response checks using the same isotope, geometry, and activity. Three instrument systems were employed to make direct surface emission measurements during the Final Status Survey of Building 779. The Contractor employed a subcontractor, Millennium Services, who used a proprietary system (SCM/SIMS) developed by Shonka Research Associates to perform the scan surveys. The SCM is fundamentally a gas proportional counter and the SIMS is the survey information management software. The Contractor also used a NE Electra with a DP-6 dual phosphor scintillation probe to make direct static surface measurements for comparison with the DCGL_w. The IVC used the Eberline model E-600 multi-purpose survey instrument with a HP-100 gas proportional probe.

Table 6-3. Comparison of Response of Instruments used to Make Direct Surface Measurements

Parameter	Millennium SCM/SIMS	NE Electra w/ DP-6	EberlineE-600 w/HP-100
Number of Measurements	20	20	20
2 π Source Surface Emission Rate	1604	1604	1604
Mean Activity Observed	1315	1261	1302
Standard Deviation	280	83	53
Coefficient of Variation	0.22	0.07	0.04

6.2 Stage II—Quality Control of the Independent Verification Sampling

Stage II QC sampling is associated specifically with the IVC's field sampling and serve to establish confidence in the independent verification sampling results rather than correlate them with the Contractor's results. Again, not every category of QC measure planned for has been completed to this point.

6.2.1 Smear Samples

The IVC provided smear samples to the GJO Analytical Laboratory for measurement and analysis. Smear sample media was reserved by the IVC prior to the start of the independent verification of Building 779. A series of these were assigned as "blanks" and a second series of smears was spiked with three different concentrations of an alpha emitting transuranic isotope of the nuclide mix identified as a contaminant of concern for the 779 Cluster.

As with the spikes prepared for the Contractor, the spikes were not certified as containing traceable concentrations of the nuclide added. Thus, the spikes do not provide a direct measure of accuracy. Instead, the spikes serve to provide a measure of confidence in the laboratory's

ability to detect radioactivity and to establish a basis for subsequent comparison between the results achieved by the Contractor and those achieved by the IVC.

The IVC introduced two blank smear and one spiked smears into the smear sampling batch during the independent verification survey of survey unit 779-35 in Building 779. The entire batch of smears was then provided to the GJO Analytical Laboratory. The QC samples were packaged and identified exactly as those samples collected in the survey unit and were not distinguishable to the analyst. Because the IVC used an independent laboratory to assay smears, and because the technician collecting the field smears was not involved with preparing, handling, or counting smears, it was possible to present the QC samples along with the field samples as a double blind set.

The blank smears were prepared by wiping a clean, unaffected, and uncontaminated surface. They were then packaged individually, assigned a unique QC sample number, and physically controlled to ensure custody and integrity. The spiked smear was prepared by pipetting liquid standard concentrations onto a smear filter disc.

Spiked smears were prepared with three different quantities of radioactivity to provide a range of gross alpha radioactivity concentrations over the range expected to be encountered in the independent verification of the Final Status Survey. The range was, again, small and near zero.

The QC samples provided to the IVC's laboratory were measured and reported to the IVC (Appendix F). Table 6-4 provides a crosswalk between the IVC and GJO Analytical Laboratory assigned sample numbers and presents a summary of the a summary of the cumulative results obtained by the laboratory.

From Table 6-4 it is seen that each blank smear returned results indicating no detectable radioactivity in excess of the method detection limit. Each of the spiked smear samples yielded measurable radioactivity. The spiked activities were differentiated from one another and the lowest result corresponded to the smear with the lowest spiked concentration while the highest result corresponded to the smear with the highest spiked concentration.

Again, no statement can be made about the accuracy of the results reported by the IVC's laboratory subcontractor but results were in line with those expected. The fact that the GJO Analytical Laboratory apparently used longer counting times than did the Contractor when measuring smears adds weight to the possibility that insufficient counting time may be at the root of the disparity in the results on QC smear samples reported by the Contractor.

As reported in the IVC Sampling and Survey Report, Building 729 (DOE 1999b) several smear samples submitted to the GJO Analytical Laboratory and to the Contractor were disposed of by the laboratories before they could be collected and provided to the other laboratory for a cross comparison of laboratory measurements. To remedy this situation, measured sets of QC samples (one for the Contractor and the other for the IVC) were prepared by the GJO Analytical Laboratory and are being introduced to the Contractor's and IVC's sampling protocol. This provides a cumulative cross comparison of the relative accuracy of the instruments and methods employed to assay smears.

Table 6-4. Results of the GJO Analytical Laboratory Assay of QC Smear Samples Provided by the IVC.

IVC QC Sample ID#	IVC Transfer Sample ID#	Laboratory Assigned Sample ID#	Sample Type	Reported Results (Gross α , dpm) ^a	
				MDA	Measured Activity
NDL 290	SMR0000260	263395	Spike	5.33	24.05
NDL 292	SMR0000261	263396	Spike	5.41	54.84
NDL 294	SMR0000262	263397	Spike	5.49	96.51
NDL 295	SMR0000593	258235	Spike	5.17	5.68
NDL 296	SMR0000168	261284	Spike	4.88	5.00
NDL 297	SMR0000592	258234	Spike	5.19	15.81
NDL 298	SMR0000169	261285	Spike	5.00	18.98
NDL 299	SMR0000591	258233	Spike	5.35	53.92
NDL 300	SMR0000170	261286	Spike	5.11	41.54
SMR0000594	SMR0000594	258236	Blank	5.13	0 ^b
SMR0000595	SMR0000595	258237	Blank	5.17	0 ^b
SMR0000596	SMR0000596	258238	Blank	5.11	0 ^b
259725	SMR0000167	261283	Blank	4.88	0 ^b
259726	SMR0000166	261282	Blank	4.91	0 ^b
259727	SMR0000165	261281	Blank	4.91	0 ^b
259728	SMR0000591	263362	Blank	5.30	0.49
259729	SMR0000592	263363	Blank	5.34	0 ^b
259733	SMR0000598	263827	Blank	4.73	0 ^b
259734	SMR0000599	263828	Blank	4.66	0 ^b
259738	SMR0000599	261638	Blank	4.91	0 ^b
259755	SMR0000164	261280	Spike	4.88	5.77
259756	SMR0000598	261639	Spike	4.97	7.30
259757	SMR0000597	261640	Spike	4.91	6.55
259758	SMR0000596	61641	Spike	4.91	7.33
259761	SMR0000163	261279	Spike	4.86	23.71
259763	SMR0000593	263364	Spike	5.39	25.85
259764	SMR0000594	263365	Spike	5.46	41.23
259765	SMR0000595	263361	Spike	5.39	35.82
259768	SMR0000597	263826	Spike	4.93	52.04
259769	SMR0000162	261278	Spike	5.13	56.34

^aThe analytical report presented results in pCi per sample. The results have been converted to dpm for presentation in this table. Since the smears were collected over a 100 cm² area, the results in dpm are equivalent to dpm/100 cm².

^bThe laboratory formally reported values as less than the detection limit (<MDA) but provided the raw supporting data in the complete analytical report. These blank QC samples resulted in a negative net count rate.

The GJO Analytical Laboratory counted the smears with a Canberra low background automated scaler, model 2404 smear counter. The measured background was 0.097 cpm over 60 minutes. Sample count time was 6 minutes. The alpha efficiency was established at 21.39 percent.

Aside from the QC measures interjected by the IVC blind to the laboratory, the independent verification sampling benefits from the internal QC applied to the measurement process within the laboratory. Three measurement QCs are employed for each batch of smears. The laboratory inserts a preparation blank (PB), a laboratory control sample (LCS) and a continuing calibration verification (CCV) for each batch of 21 smears. In this case, because the batch was larger than 21 smears, two sets of laboratory initiated QC measurements were made. Table 6-5 summarizes the internal QC measurements made for the smears from survey unit 779-35.

Table 6-5. Results of the IV Laboratory Internal QC Measurements for Smear Samples

QC Sample Type	Expected Results	MDA	Measured Activity
		(Gross α , dpm)	
Preparation Blank	<MDA	4.64	-0.42
Preparation Blank	<MDA	4.66	-0.42
Laboratory Control Sample	475	8.50	464
Laboratory Control Sample	475	8.41	427
Continuing Calibration Verification	2,220	22.40	2,225
Continuing Calibration Verification	2,220	22.29	2,316

The analytical report presented results in pCi per sample. The results have been converted to dpm for presentation in this table. Since the smears were collected over a 100 cm² area, the results in dpm are equivalent to dpm/100 cm².

The internal QC data presented in Table 6-5 shows excellent agreement with the results expected.

6.2.2 Surface Media Samples

Stage II QC samples for the surface media sample sets are presented in Table 6-2. In addition to the Stage II QC samples, the IVC's laboratory performed internal QC measurements to assess the quality of the data produced. Three measurement QCs were employed for each of the three element groups (Am, Pu, U) processed for each survey unit. The laboratory inserted one PB, a LCS, and processed a duplicate of one randomly selected field sample for each sample batch. In all, there were eight PBs, eight LCSs, and two duplicate measurements made. Table 6-6 summarizes the PB QC measurements made. Table 6-7 summarizes the LCS measurements and Table 6-8 presents the duplicate sample measurements. Table 6-8 summarizes the cumulative paired duplicate measurement results collected from survey units 729-01, 779-04, 779-17, 779-21, 779-23, and 779-35. A regression analysis was performed to assess the comparability between the first and duplicate measurements and is graphically presented in Figure 6-1.

Table 6-6. Results of the IV Laboratory Internal Blank QC Measurements for Surface Media Samples

Preparation Blank QC Sample (PB)	Expected Results	MDA	Measured Activity
		dpm / sample	
Am-241	<MDA	0.02	0.03 ^a
Am-241	<MDA	0.03	0.04 ^a
Am-241	<MDA	0.02	0.03 ^a
Pu-238	<MDA	0.02	0.001
Pu-238	<MDA	0.03	0.001
Pu-238	<MDA	0.02	0.003
Pu-239/240	<MDA	0.03	0.005
Pu-239/240	<MDA	0.05	0.003
Pu-239/240	<MDA	0.04	0.004
U-234	<MDA	0.03	0.01
U-234	<MDA	0.04	0.03
U-235	<MDA	0.08	-0.01
U-235	<MDA	0.03	-0.003
U-238	<MDA	0.04	0.01
U-238	<MDA	0.03	0.03

^aThe error in the reported result includes the MDA for the measurement.

Table 6-7. Results of the IV Laboratory Internal LCS QC Measurements for Surface Media Samples

Laboratory Control QC Sample (LCS)	Expected Results	MDA	Measured Activity
	pCi/mL (Am and Pu)		pCi/L (U)
Am-241	4.74	0.06	4.49
Am-241	4.74	0.06	4.57
Am-241	4.74	0.05	4.72
Pu-238	10.67	0.04	10.22
Pu-238	10.67	0.06	10.53
Pu-238	10.67	0.02	10.55
Pu-239/240	10.5	0.06	10.64
Pu-239/240	10.5	0.08	10.30
Pu-239/240	10.5	0.08	11.42
U-234	16.6	0.12	16.43
U-234	16.6	0.08	16.77
U-235	0.77	0.13	0.99
U-235	0.77	0.06	0.84
U-238	16.6	0.10	15.50
U-238	16.6	0.05	16.48

The units reported for the LCS measurements are different from those used in the rest of the analytical report. The selection of units of pCi/mL and pCi/L was based on convenience since the known value of the standard used is reported in pCi/mL and pCi/L. The function and utility of the LCS sample (comparing a measurement result with a known standard) are not compromised by using units other than those used to report sample results.

Table 6-8. Results of the IV Laboratory Internal Duplicate QC Measurements for Surface Media Samples

Duplicate QC Samples (D) Lab Sample ID#	Measured Activity (dpm / sample)			
	263921	263921D	263931	263931D
Am-241	2.34 ^a	1.52 ^a	0.31 ^a	0.39 ^a
Pu-238	0.13 ^a	0.08 ^a	0.11 ^a	0.12 ^a
Pu-239/240	11.97	6.64	0.15 ^a	0.23 ^a
U-234	22.39	27.03	16.82	16.54
U-235	1.64	1.26 ^a	1.19	0.90
U-238	23.25	27.32	19.29	16.30

^aEither the reported value is less than the MDA for the analysis or the error in the reported result includes the MDA. In this case, reproducibility between duplicate samples is not achievable with high confidence since relative error is high at sample concentrations near the MDA. That the duplicate samples yield results which are consistently at or near the MDA for the analysis provides evidence, in a qualitative sense, that duplicate measurements are comparable.

The internal QC data presented in Tables 6-6, 6-7, and 6-8 provide substantial indication that the data quality achieved in the surface media sample analysis is excellent.

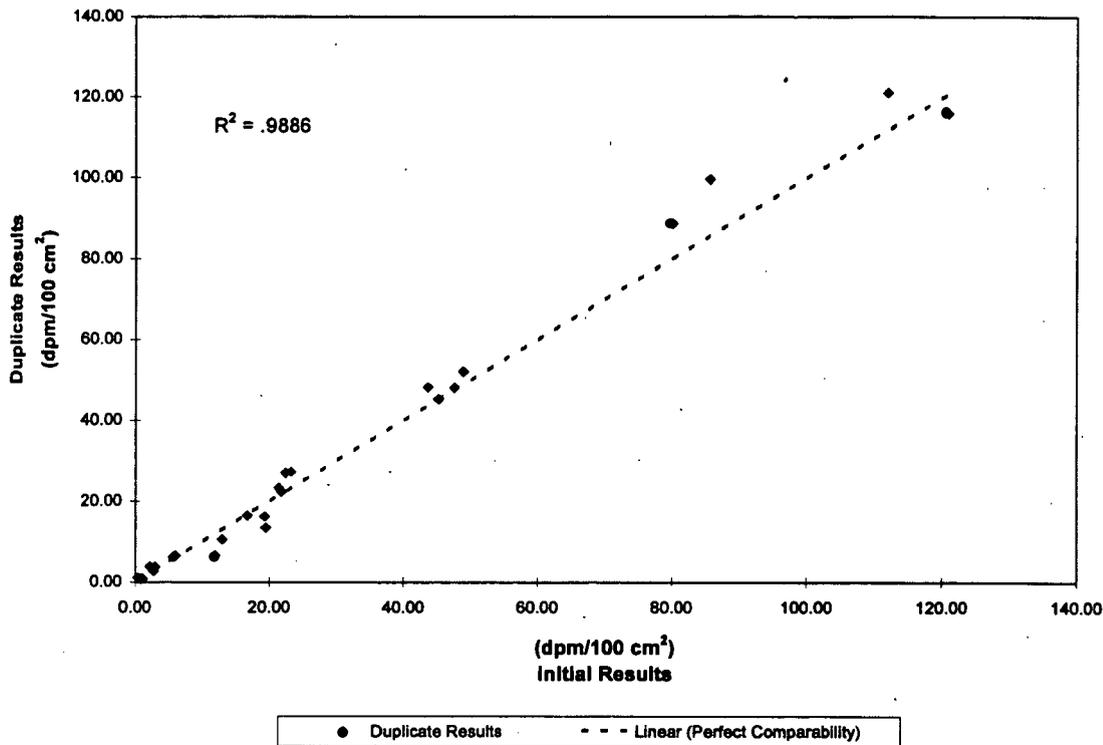


Figure 6-1. Comparison of Duplicate Alpha Isotopic Sample Analysis Results Linear Regression Fit Plot

6.2.3 Direct Static Measurements

Two sets of data collected by the IVC are pertinent to the assessment of direct static surface measurement data quality. They are replicate field measurement data and instrument response check data.

6.2.3.1 Replicate Field Measurements

The second of the two data sets contains the replicate measurements periodically made over the duration of the sampling period. Five replicate measurements were made in survey unit 779-35. Table 6-9 summarizes the cumulative paired replicate measurement results collected from survey units 729-01, 779-04, 779-17, 779-21, 779-23, and 779-35. A regression analysis was performed to assess the comparability between the initial and replicate measurements and is graphically presented in Figure 6-2.

Table 6-9. Results of Replicate Direct Static Surface QC Measurements

Sample Location	Measured Activity(dpm/100 cm ²)	
	Initial Measurement	Replicate Measurement
IVP0000104	11.5	10.9
IVP0000111	7.5	8.1
IVP0000118	26.0	19.6
IVP0000119	5.0	5.0
IVP0000122	6.0	6.3
IVP0000104	11.5	10.9
IVP0000111	7.5	8.1
IVP0000118	26.0	19.6
IVP0000119	5.0	5.0
IVP0000122	6.0	6.3
IVP0000125	27.2	29.2
IVP0000128	12.1	14.9
IVP0000129	30.2	26.4
IVP0000135	13.2	13.1
IVP0000136	7.0	13.8
IVP0000149	21.1	14.0
IVP0000152	20.5	17.0
IVP0000153	34.4	20.6
IVP0000155	10.6	10.8
IVP0000159	16.1	16.1
IVP0000176	38.5	32.1
IVP0000182	19.3	3.2
IVP0000187	12.8	22.4
IVP0000194	22.4	22.4
IVP0000206	16.60	16.60
IVP0000212	20.70	29.00
IVP0000218	10.60	13.90
IVP0000226	41.40	16.60
IVP0000236	20.50	27.50
IVP0000242	14.30	11.10
IVP0000248	13.70	20.50
IVP0000254	10.60	10.50
IVP0000259	17.70	7.59
IVP0000276	8.28	8.28
IVP0000282	12.40	12.40
IVP0000288	6.57	10.00
IVP0000294	20.00	16.60
IVP0000299	16.90	10.00

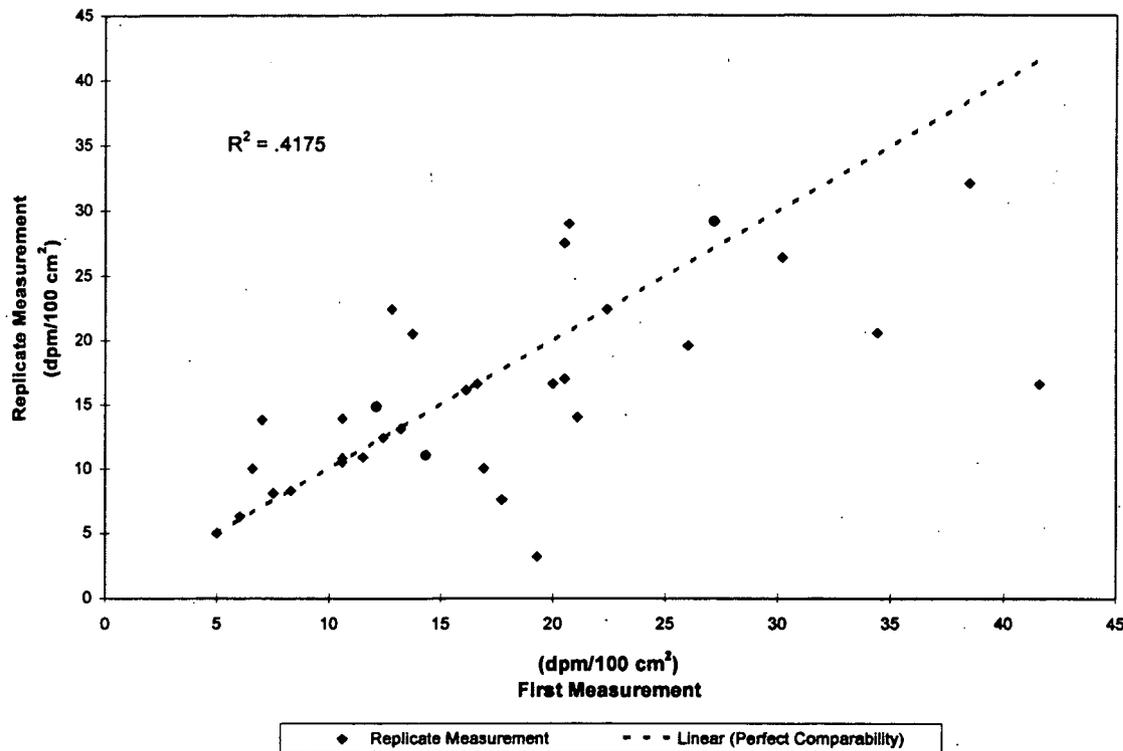


Figure 6-2. Comparison Between Replicate Direct Static Measurements
Linear Regression Fit Plot

6.2.3.2 Instrument Response Check Data

The first of the two data sets used to present the quality of direct static surface measurements is the response of the instruments (E600 with a HP-100 probe) to a planar source with a known amount of radioactivity. The source used was the same source used by the Contractor. It is an anodized surface source containing 2,398 dpm of Pu-239 radioactivity. The source was manufactured and certified to be NIST traceable by AEA Technology and assigned a unique ID# GM-785 (See copy of manufacturer's certification in Appendix B).

Prior to initiating a survey each day, periodically (\approx every 2 hours), and at the end of a survey each day, the survey instrument in use was used to make a measurement on the known concentration source. The data sheets are provided for each of the two probes used by the IVC during the independent verification of survey unit 779-35 (Appendix D). A total of 30 response check measurements were made with two different probes during the survey period.

Control charts are provided for each probe (Figures 6-3 and 6-4) to graphically portray the steadfastness of the instrument's responses to the source over the sampling period. Notable is the relatively tight band within which the response checks fall and the consistency between probes. No degradation of the instrument response was observed over the period it was used indicating that the 2 hour maximum use constraint on a fresh counting gas charge is adequate and might provide justification for a longer allowable period between purge and charge cycles.

Instrument Response Check Control Chart HP-100 Probe #S16338

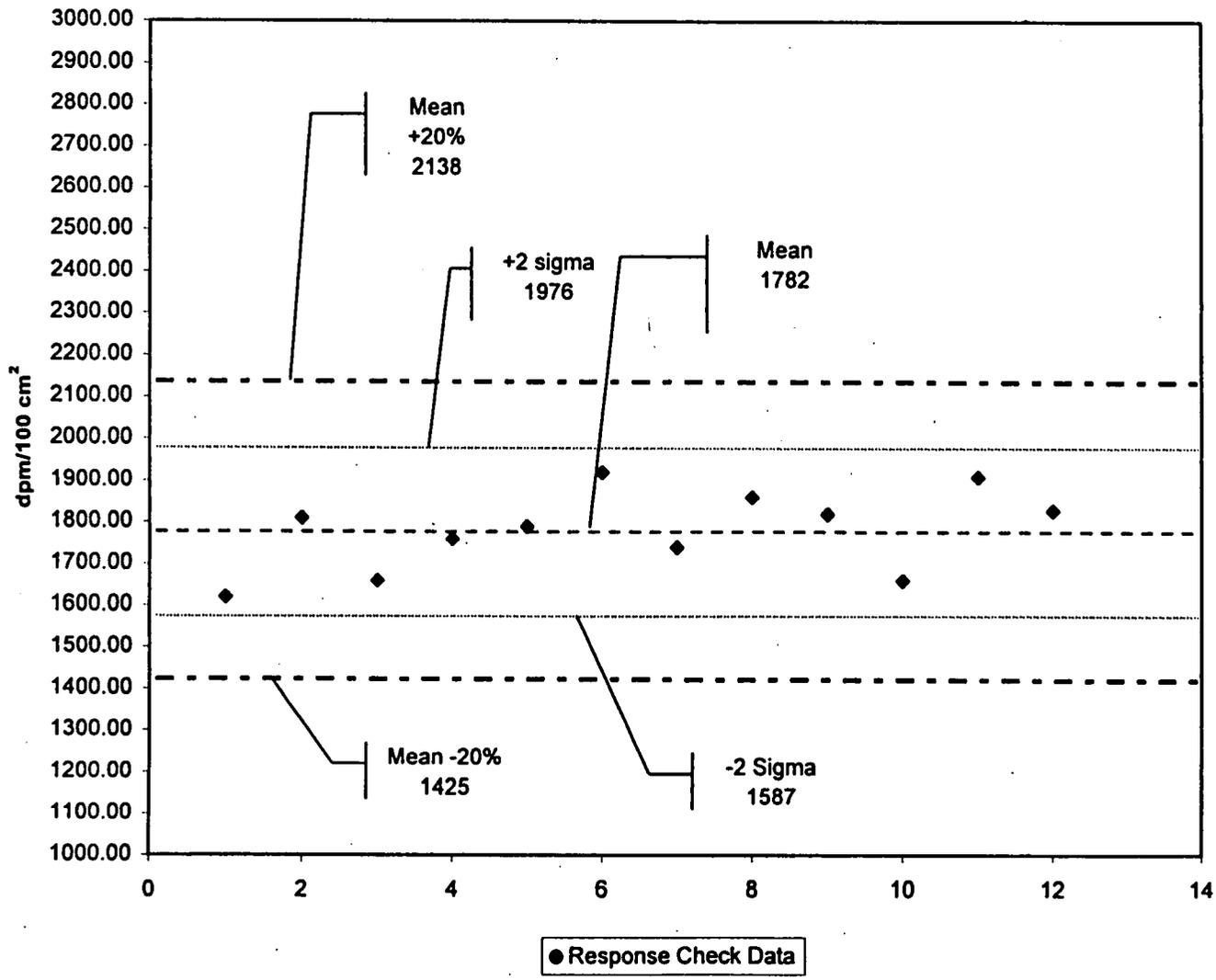


Figure 6-3. Instrument Response Check Control Chart
HP-100 Probe #S16338

73

73

Instrument Response Check Control Chart HP-100 Probe #S15564

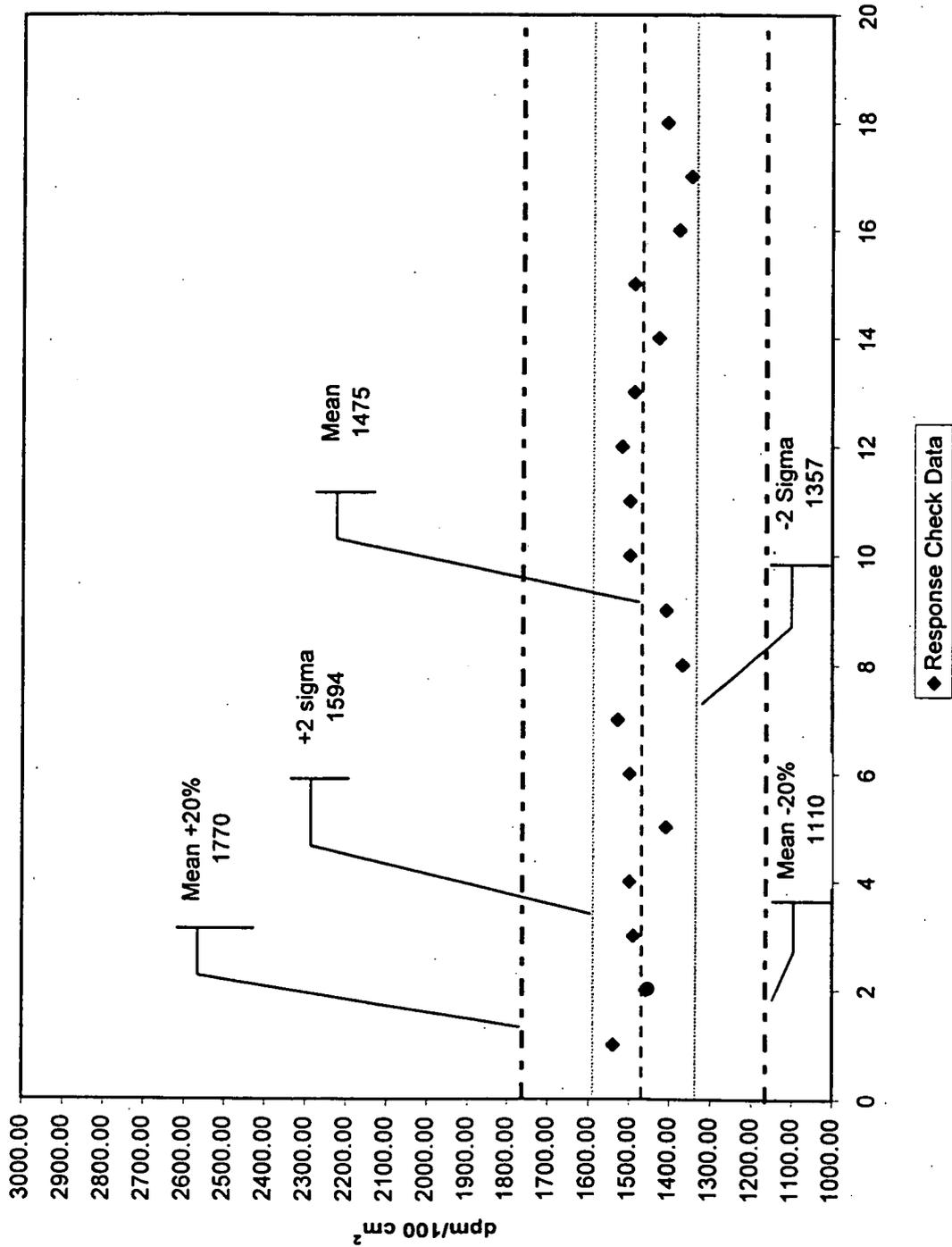


Figure 6-4. Instrument Response Check Control Chart
HP-100 Probe #S15564

End of current text

75

7.0 Data Quality Analysis

The purpose of this data quality analysis (DQA) is to evaluate the data collected from the field in light of its intended use in decision making. Decision makers should obtain an understanding of the verity of the data used in the verification process from reading this section. The DQA uses guidance from *MARSSIM* (EPA 1997), *Guidance for Data Useability in Risk Assessment* (EPA 1992), information from the IV SAP (DOE 1999a), and professional judgement.

7.1 Detection Limit Adequacy

Each of the three measurement methods used to assess the residual radioactive contamination in the Main Building have measurement sensitivities which limit the ability of the measurement to detect and quantify radioactivity. A key concern and design element of the SAP was to assure that sufficiently low detection sensitivities were achieved. Assumptions had to be made about the environment and response of the instrumentation and preparation methods in order to estimate the detection sensitivity before the fact. Now that the measurements have actually been made, assessment of the actual detection sensitivity achieved is possible. Section 6.0 presented data which demonstrated that the detection sensitivities achieved were adequate to identify and quantify radioactivity at a fraction of the applicable limit or DCGL. The target detection sensitivity planned for in the SAP was ≈ 50 percent of the applicable DCGL. Method detection limits obtained in both the field measurements and the laboratory measurements used were adequate to compare to the associated DCGL as indicated in Table 7-1, and met or exceeded the data quality target for measurement sensitivity.

Table 7-1. Adequacy of Independent Verification Measurement Detection Limits

Measurement	Analytical Method	DCGL Benchmark (dpm/100 cm ²)	Detection Sensitivity Achieved (dpm/100 cm ²)
Average removable surface contamination concentration.	Smear counting	20	≈ 5
Average transuranic surface contamination concentration as measured by direct surface emission.	90 Second Direct Static Surface Emission Count	100	43 ^a
Maximum transuranic surface contamination concentration as measured by direct surface emission.		300	
Average surface transuranic contamination concentration in and beneath surface coatings as measured by surface media sampling.	Alpha Spectroscopy	100	≈ 4
Maximum surface transuranic contamination concentration in and beneath surface coatings as measured by surface media sampling.		300	
Average surface uranium contamination concentration in and beneath surface coatings as measured by surface media sampling.	Alpha Spectroscopy	5,000	≈ 5
Maximum surface uranium contamination concentration in and beneath surface coatings as measured by surface media sampling.		15,000	
^a The detection sensitivity reported is net MDA. The adjusted gross MDA is equal to the MDA + background (58 dpm/100 cm ²).			

If detection limits had exceeded the DCGL metrics, then declarations based on measurements made using that method could not have been substantiated. As evidenced by comparing the decision limits as represented by the DCGLs with the MDA associated with the measurement method employed in assessing the residual contamination in the Main Building, each detection limit obtained was more than adequate to detect, observe, and make risk management decisions with confidence.

7.2 Sample Size and Statistical Power

According to the SAP, sample sizes were specified to ensure a false positive error rate (alpha error) and a false negative error rate (beta error) of no greater than 5 percent when measurement data sets were compared to the DCGL. For each sample media set—direct surface emission measurements, smears, and surface media samples—a sample size of 29 (allowing for a 20 percent contingency) was specified in the IV SAP (DOE 1999a). In the field, 29 direct surface emission measurements, 29 smears, and 24 surface media samples were actually collected from designated locations in the Main Building.

Based on the results of each of the data sets, retrospective power curves were developed. Figures 7-1 through 7-4 illustrate the power of the sign test to conclude whether the null hypothesis should be rejected by measuring the probability that a survey unit meets the DCGL. Values of both error types (Type-I and Type-II) can be derived from the power curve at any possible concentration of residual contaminant. Type-I errors (falsely concluding that the DCGL *is not exceeded* when it actually is exceeded) are those that concern the risk manager and decision maker most. The actual and critical sample size (N) are both presented for each of the four data sets evaluated. The retrospective power curve is calculated using the actual sample size obtained. The boundary of the gray region represents the concentrations between which there is insufficient power at the prescribed alpha and beta error rate, given the sample size obtained and the variability observed in the data set.

Inspection of Figure 7-1 illustrates that the Type-I error rate drops below 5 percent (the error rate is 1-Power) when the true mean surface contamination concentration is at the DCGL of 100 dpm/100 cm², the sample size is 29, and the standard deviation is 5.2 dpm/100 cm² (the actual standard deviation). Alternately, the power to reject the null hypothesis when the mean surface contamination concentration is as high as 95 dpm/100 cm² is 95 percent. The critical sample size required to provide the power necessary to meet the sampling objectives outlined in the SAP was determined to be 19. The actual sample size (29) was much higher than that required, thus the actual power was much higher than required by the sample design. Note that the estimate of the central tendency, the arithmetic mean, is plotted against the power curve. This concentration is significantly less than the concentration at which the power begins to wane (the lower boundary of the gray region). The power to reject the null hypothesis at the observed mean concentration in the survey unit is effectively 100 percent.

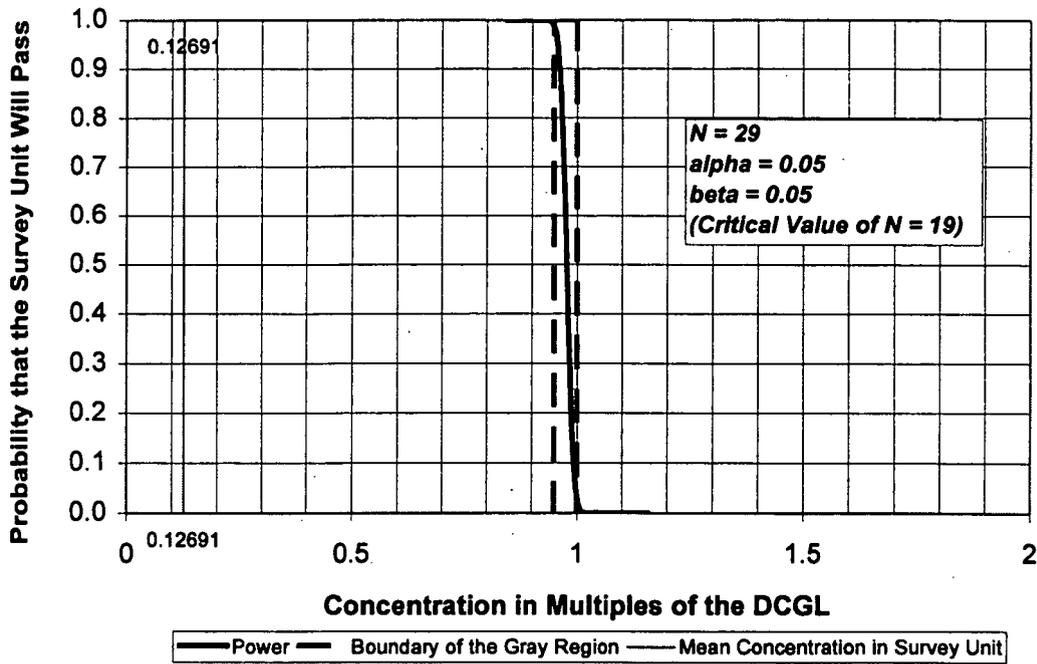


Figure 7-1. Retrospective Power of the Sign Test—Direct Static Surface Measurements

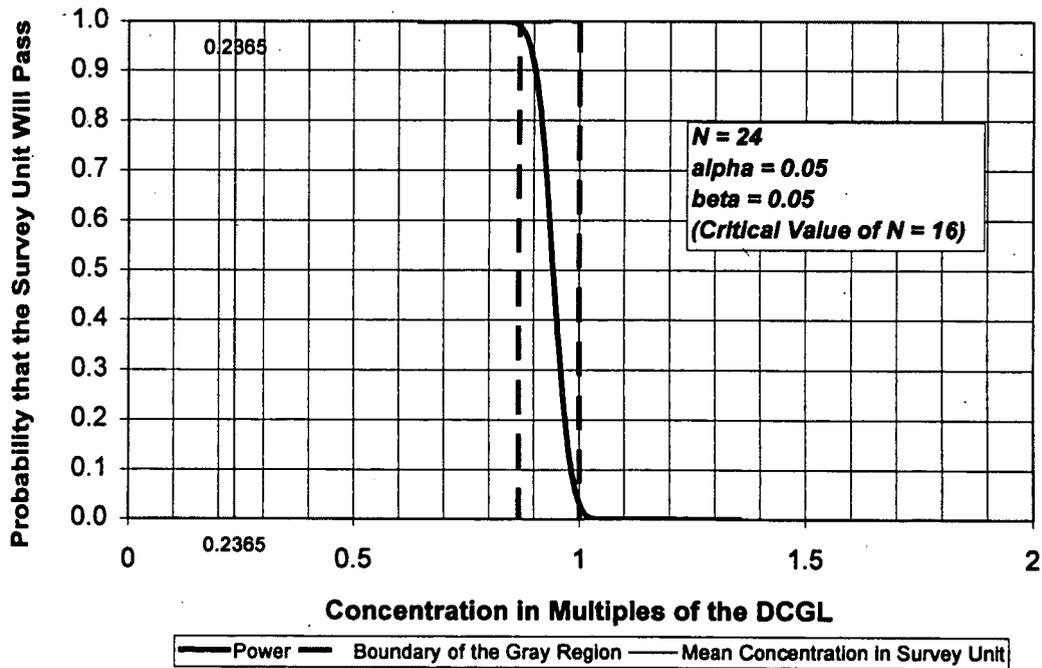


Figure 7-2. Retrospective Power of the Sign Test—Smear Sample Measurements

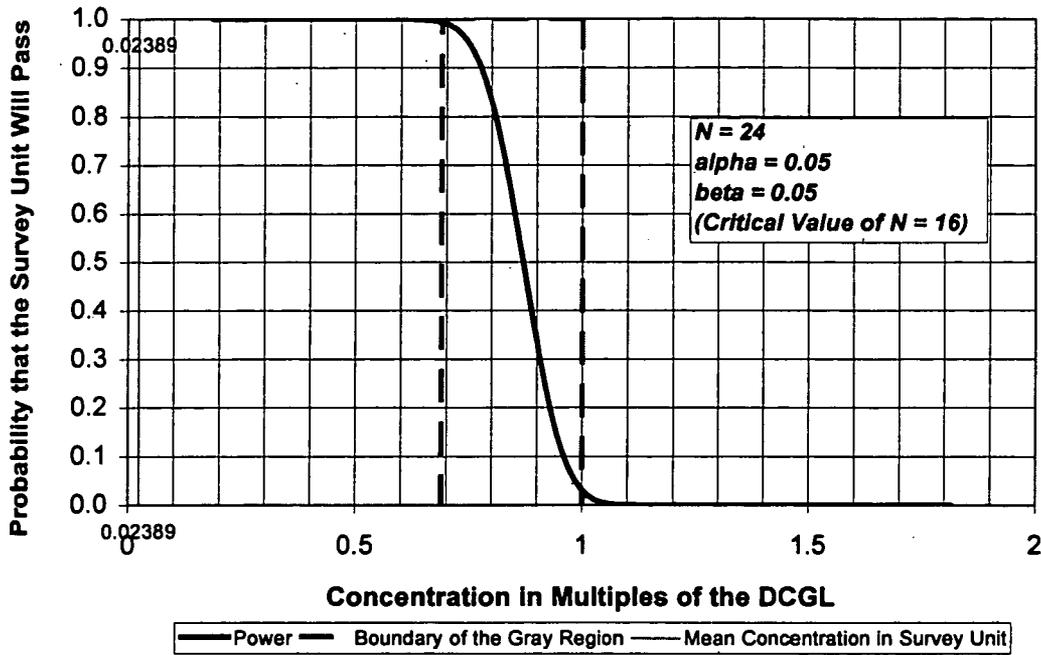


Figure 7-3. Retrospective Power of the Sign Test—Surface Media Samples/Transuranic Activity

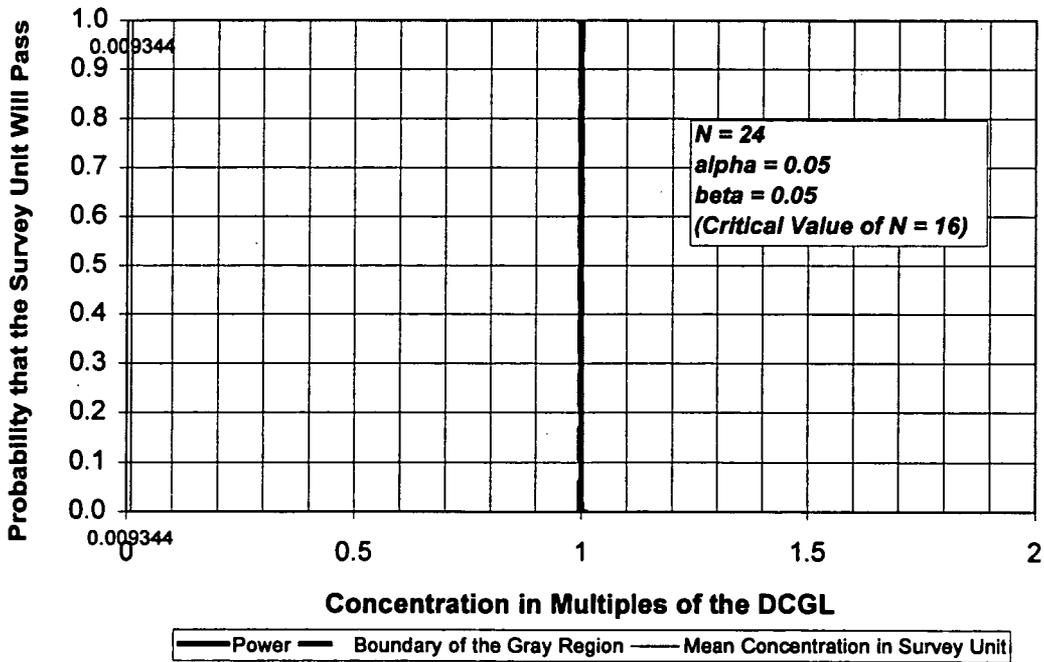


Figure 7-4. Retrospective Power of the Sign Test—Surface Media Samples/Uranium Series Activity

79

The same results are observed in Figures 7-2 through 7-4. Except for the surface media sample results, rigorous statistical tests of the other data sets are not justified since it is known that every data point comprising each of these data sets was less than the applicable DCGL. When this occurs, the sign test will always conclude that the null hypothesis should be rejected, provided that a sufficient number of measurements have been included in the data set (i.e., actual sample size is greater than or equal to the critical sample size). Thus, risk managers can be assured that the data collected is sufficiently robust to decide that the residual surface contamination concentration in the survey unit measured is below the DCGL. However, this is not the case with the surface media sample results.

Since one of the survey media measurements exceeded the $DCGL_w$, even though the average was less than the $DCGL_w$, the sign test was used to evaluate whether the median of the data was above or below the DCGL. To validate the use of the sign test, an evaluation is made to determine that the data are consistent with the following underlying assumptions of the test: spatial independence, symmetry, data variance, and adequate power. These assumptions were verified by the review of data presented in Figures 5-2, 5-7, 3-5, and 7-3, respectively. The sign test clearly demonstrates that the median surface media sample result is less than the $DCGL_w$ (Appendix I).

7.3 Measurement Uncertainty and Data Quality Indicators

As discussed in the IV SAP (DOE 1999a), measurement uncertainty stems from two sources: field sampling variation, and instrument/laboratory measurement variation. Of the two sources, field sampling variation was noted as the greatest contributor to overall uncertainty because of the inherent logistics of sample collection and the one-of-a-kind aspect of sampling the building. The field measurement methods used in the building survey were standard Health Physics instrument techniques and were governed by approved procedures used in the field sampling process. Laboratory procedures were also utilized by the GJO Analytical Laboratory to assess the radioactivity associated with both smear samples and surface media samples. Surface media samples were weighed prior to sample preparation to minimize error due to sample mass loss during sample preparation. An additional control feature utilized to minimize variability and error in the surface media samples was to homogenize the sample by grinding the surface veneer material removed to a fine powder. In this way, any aliquot of the sample selected for analysis could be confidently expected to yield comparable results.

As discussed in the IV SAP (DOE 1999a), an important activity in determining the usability of the data based on sampling is assessing the effectiveness of the sampling program (EPA 1998, EPA 1992). Data Quality Indicators (DQIs) were identified as guidelines for the DQA process to provide quantitative and qualitative measures of overall data quality and usability. For comparative purposes, Table 7-2 repeats the target DQIs from the IV SAP and summarizes the post-sampling data quality assessment.

It is important to note that the Quality Object for instrument precision (r^2 of ≈ 0.75) was not achievable due to the absence of residual contamination. Most of the sampling area did not contain residual contamination greater than background. When developing the SAP it was assumed that a significant amount to residual contamination above background would be present and a value of 0.75 for r^2 should be achievable. As a result of rigorous decontamination most measurement results were at or below background activity levels and statistical variability was

high. This Quality Object will be changed to reflect a more realistic object based on the low activity levels found in the Building 779 Cluster.

Inspection of Table 7-2 indicates that the DQIs are achieved and the data is regarded as having sufficient quality to be useable for verification of the DCGL and for assessing the results and conclusions obtained by the Contractor.

7.4 Overall Quality Assurance and Quality Control

Based on the forgoing analysis and observed practices in the field, it is apparent that overall project QA/QC goals were obtained. The key technical features of the project included:

The DCGL derivation and SAP development processes were performed in accordance with EPA guidance for DQOs (EPA 1997 and EPA 1993).

Field operations were conducted in accordance with the SAP. Modifications to the sample locations which were either inaccessible or involved appreciable personnel safety hazards were made in accordance with the approved sample relocation procedure outlined in the SAP.

Data analysis was conducted as prescribed by the SAP and in general agreement with EPA guidance (EPA 1997 and EPA 1992).

There were no significant problems or incidents that would compromise the findings. The data collected from the building survey is regarded as useable.

8.0 Summary and Conclusions

8.1 Independent Verification Sampling and Survey

On the basis of the analysis presented in Sections 3.0 through 7.0 of this report, the IVC has demonstrated that the survey unit selected for independent verification (779-35) has met each of the compliance benchmarks, or DCGLs. These results show that residual surface radiological contamination is well below the agreed upon benchmarks for the Building 779 Cluster Decontamination and Decommissioning project applicable to the Main Building. Table 8-1 provides a summary review of the DCGLs compared to the appropriate compliance parameter. The independent verification sampling and survey results are highly reliable and consistent with the field sampling and survey design. No unexpected results or trends are evident in the data. The sampling and survey results determined that residual radiological contamination in the Main Building is very minimal and, for the most part, barely above background levels. Thus, the IVC concludes that the null hypothesis for survey unit 779-35 (that residual radiological surface contamination exists in concentrations above the DCGLs) should be rejected.

Table 8-1. Comparison of Building 779 DCGLs to Observed Compliance Parameters

Metric	Surface Radioactivity (dpm/100 cm ²)			Pass/Fail
	DCGL	Actual		
		(UCL ₉₅)	Maximum	
Mean surface contamination as measured by direct surface emission	100	14.7		Pass
Maximum surface contamination as measured by direct surface emission	300		20.5	Pass
Mean removable surface contamination	20	<4.73		Pass
Mean total transuranic surface contamination on and beneath a surface with a surface coating as measured by surface media sample	100	20.1		Pass
Maximum total transuranic surface contamination on and beneath a surface with a surface coating as measured by surface media sample	300		134	Pass
Mean total uranium series surface contamination on and beneath a surface with a surface coating as measured by surface media sample	5,000	46.7		Pass
Maximum total uranium series surface contamination on and beneath a surface with a surface coating as measured by surface media sample	15,000		86	Pass

8.2 Independent Review of the Contractor's Final Status Survey Report and Conclusions

The IVC has completed a comprehensive review of the Contractor's Closeout Radiological Survey Report for the Main Building (RMRS 1999c) and concurs with the conclusion reached by the Contractor—that each survey unit in the Main Building met the applicable DCGLs and that the building should be released from further radiological controls.

End of current text

83

9.0 References

Rocky Mountain Remediation Services, L.L.C. 1999a. *Closeout Radiological Survey Plan For The 779 Cluster*, RF/RMRS-97-123.UN, Revision 2, Golden, Colorado, December.

———, 1999b. *779 Cluster Final Survey Breakdown Structure*, Revision 0, Golden, Colorado, May.

———, 1999c. *Closeout Radiological Survey Report For Building 779, Main Building*, RF/RMRS-99-476.UN, Revision 0, Golden, Colorado, April.

———, 1998. *Statement of Work for 779 Closure Project Independent Verification Support*, prepared by Safe Sites of Colorado, L.L.C., and Rocky Mountain Remediation Services, L.L.C. for the U.S. Department of Energy Rocky Flats Field Office, Golden, Colorado, October.

———, 1997. *Decommissioning Operations Plan For The 779 Cluster Interim Measure/Interim Remedial Action*, RF/RMRS-97-085.UN, Revision 0, Golden, Colorado, October.

U.S. Department of Energy, 1999a. *Independent Verification Sampling and Analysis Plan for Building 779 Cluster*, prepared by MACTEC-ERS for the U.S. Department of Energy, Grand Junction and Rocky Flats Operations Offices, Colorado.

———, 1999b. *Sampling and Survey Report, Evaluation and Interpretation of the Residual Radiological Surface Contamination Sampling Results, Building 729*, prepared by MACTEC-ERS for the U.S. Department of Energy, Grand Junction and Rocky Flats Operations Offices, Colorado.

U.S. Environmental Protection Agency, 1998. *Guidance for Data Quality Assessment—Practical Methods for Data Analysis*, EPA QA/G-9, EPA/600/R-96/084, Office of Research and Development, Washington, DC.

———, 1997. *Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)*, EPA 402-R-97-016, Office of Air and Radiation, Washington, DC.

———, 1994. *Guidance for the Data Quality Objectives Process*, EPA QA/G-4, EPA/600/R-96/055, Office of Research and Development, Washington, DC.

———, 1993. *Data Quality Objectives Process for Superfund*, EPA 540-R-93-071, Office of Solid Waste and Emergency Response, Washington, DC.

———, 1992. *Guidance for Data Usability in Risk Assessment*, PB 9285.7-09A, Office of Emergency and Remedial Response, Washington, DC.

———, 1988. *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA*, EPA/540/G-89/004, Office of Emergency and Remedial Response, Washington, DC.

U.S. Nuclear Regulatory Commission, 1997. *Minimum Detectable Concentrations with Typical Radiation Survey Instruments for Various Contaminants and Field Conditions*, NUREG-1507, Office of Nuclear Regulatory Research, Washington, DC.

———, 1995. *A Nonparametric Statistical Methodology for the Design and Analysis of Final Status Decommissioning Surveys*, Draft Report for Comment, NUREG-1505, Office of Nuclear Regulatory Research, Washington, D.C.

———, 1992. *Manual for Conducting Radiological Surveys in Support of License Termination*, Draft Report for Comment, NUREG/CR-5849, Office of Nuclear Regulatory Research, Washington, D.C.

WASTREN-GJ, (updated continually). *Handbook of Analytical and Sample-Preparation Procedures, Volumes I, II, and III*, U.S. Department of Energy, Grand Junction Office, Grand Junction, Colorado.

Appendix A
Random Selection Data

Random Selection Program to Select Survey Units for IV

Five survey units are to be selected for this building.

CTRL - ALT - F9 to recalculate

Random Number Selected =	185
Random Number Selected =	131
Random Number Selected =	218
Random Number Selected =	105
Random Number Selected =	28

Building 779

Survey Unit ID#

228

Class (1, 2, 3) Weighting

Survey Unit ID#	Class	Weighting	Order	Survey Unit ID#	Weighting
779-01 (interior)	2	3	1	779-01	31
779-02 (exterior walls)	2	3	2	779-01	32
779-03 (exterior roof)	2	3	3	779-01	33
779-04	2	3	4	779-02	34
779-05	2	3	5	779-02	35
779-06	2	3	6	779-02	36
779-07	2	3	7	779-03	37
779-08	2	3	8	779-03	38
779-09	2	3	9	779-03	39
779-10	3	1	10	779-04	40
779-11	2	3	11	779-04	41
779-12	3	1	12	779-04	42
779-13	2	3	13	779-05	43
779-14	3	1	14	779-05	44
779-15	2	3	15	779-05	45
779-16	2	3	16	779-06	46
779-17	2	3	17	779-06	47
779-18	2	3	18	779-06	48
779-19	1	6	19	779-07	49
779-20	1	6	20	779-07	50
779-21	1	6	21	779-07	51
779-22	1	6	22	779-08	52
779-23	1	6	23	779-08	53
779-24	1	6	24	779-08	54
779-25	1	6	25	779-09	55
779-26	1	6	26	779-09	56
779-27	1	6	27	779-09	57
779-28	1	6	28	779-10 (1)	58
779-29	1	6	29	779-11	59
779-30	1	6	30	779-11	60
779-31	1	6			
779-32	1	6			
779-33	1	6			
779-34	1	6			
779-35	1	6			
779-36	1	6			

(1) Survey unit was changed to 779-17 by Contractor.

Building 779

779-37	1	6
779-38	2	3
779-39	2	3
779-40	1	6
779-41	1	6
779-42	2	3
779-43	1	6
779-44	1	6
779-45	2	3
779-46	1	6
779-47	1	6
779-48	1	6
779-49	1	6
779-50	1	6

88

Building 779

779-11	61	779-21	91	779-26	121	779-31	151	779-36
779-12	62	779-21	92	779-26	122	779-31	152	779-36
779-13	63	779-21	93	779-26	123	779-31	153	779-36
779-13	64	779-21	94	779-26	124	779-31	154	779-36
779-13	65	779-21	95	779-26	125	779-31	155	779-36
779-14	66	779-21	96	779-26	126	779-31	156	779-36
779-15	67	779-22	97	779-27	127	779-32	157	779-37
779-15	68	779-22	98	779-27	128	779-32	158	779-37
779-15	69	779-22	99	779-27	129	779-32	159	779-37
779-16	70	779-22	100	779-27	130	779-32	160	779-37
779-16	71	779-22	101	779-27	131	779-32 (3)	161	779-37
779-16	72	779-22	102	779-27	132	779-32	162	779-37
779-17	73	779-23	103	779-28	133	779-33	163	779-38
779-17	74	779-23	104	779-28	134	779-33	164	779-38
779-17	75	779-23	105	779-23 (2)	135	779-33	165	779-38
779-18	76	779-23	106	779-28	136	779-33	166	779-39
779-18	77	779-23	107	779-28	137	779-33	167	779-39
779-18	78	779-23	108	779-28	138	779-33	168	779-39
779-19	79	779-24	109	779-29	139	779-34	169	779-40
779-19	80	779-24	110	779-29	140	779-34	170	779-40
779-19	81	779-24	111	779-29	141	779-34	171	779-40
779-19	82	779-24	112	779-29	142	779-34	172	779-40
779-19	83	779-24	113	779-29	143	779-34	173	779-40
779-19	84	779-24	114	779-29	144	779-34	174	779-40
779-20	85	779-25	115	779-30	145	779-35	175	779-41
779-20	86	779-25	116	779-30	146	779-35	176	779-41
779-20	87	779-25	117	779-30	147	779-35	177	779-41
779-20	88	779-25	118	779-30	148	779-35	178	779-41
779-20	89	779-25	119	779-30	149	779-35	179	779-41
779-20	90	779-25	120	779-30	150	779-35	180	779-41

(2) Survey unit was changed to 779-21 by Contractor.

(3) Survey unit was changed to 779-23 by Contractor.

Building 779

181	779-42	211	779-48
182	779-42	212	779-48
183	779-42	213	779-48
184	779-43	214	779-48
185	779-43	(4) 215	779-48
186	779-43	216	779-48
187	779-43	217	779-49
188	779-43	(5) 218	779-49
189	779-43	219	779-49
190	779-44	220	779-49
191	779-44	221	779-49
192	779-44	222	779-49
193	779-44	223	779-50
194	779-44	224	779-50
195	779-44	225	779-50
196	779-45	226	779-50
197	779-45	227	779-50
198	779-45	228	779-50
199	779-46		
200	779-46		
201	779-46		
202	779-46		
203	779-46		
204	779-46		
205	779-47		
206	779-47		
207	779-47		
208	779-47		
209	779-47		
210	779-47		

- (4) Survey unit was changed to 779-35 by Contractor.
- (5) Survey unit was changed to 779-04 by Contractor.

96

Random Selection Program to Select Survey Start Point

Random Start Number Selected = 167

CTRL - ALT - F9 to recalculate

Building #	779
Survey Unit ID#	779-35
Class (1, 2, 3)	1
# of Potential Sample Locations	209
Total Number of Samples Required	29
Sample Frequency	7

Appendix B

Manufacturer's Certification



AEA Technology
QSA Inc.
40 North Avenue
Burlington, MA 01803
Telephone (781) 272-2000
Telephone (800) 815-1383
Facsimile (781) 273-2216

CERTIFICATE OF CONFORMANCE

TO: MACTEC-ERS, LLC
For the U.S. DoE
2597 B-3/4 Road
Grand Junction, CO 81503

This is to certify that the items listed below, which were ordered against purchase order number 21764, meet AEA Technology QSA Inc's catalogue specifications and that they comply with the requirements specified in the purchase order. AEA Technology QSA Inc certifies that all materials were produced and controlled in accordance with our documented Quality Assurance Program.

<u>Item No.</u>	<u>Quantity</u>	<u>Product Code</u>	<u>Description</u>	<u>Serial No.</u>
1	1	PIR07012	Pu-239 Anodized aluminum source, AD-100x150mm, OD-120x170mm, NIST traceable*, Overall uncertainty +/-6% at 95% confidence level	GM-785

*Calibration test records are on file in our measurement laboratory and are available for contractor's review, if required.

Ross Jones
Technical Sales Manager

13th April 1999

DEUTSCHER KALIBRIERDIENST **DKD**

Kalibrierlaboratorium für Meßgrößen der Radioaktivität
Calibration laboratory for measurements of radioactivity

AKKREDITIERT DURCH DIE
PHYSIKALISCH-TECHNISCHE BUNDESANSTALT (PTB)



AEA Technology QSA GmbH

Postfach 58 42 Gieselweg 1
 D-38049 Braunschweig D-38110 Braunschweig

Tel. +49 (0) 5307 932-0
 Fax +49 (0) 5307 932-194

Source no. GM 785

05872
DKD-K-06501
99-03

Kalibrierschein
Calibration Certificate

Kalibrierzeichen
Calibration mark

Gegenstand
Object **Alpha Wide Area Reference Source**

Hersteller
Manufacturer **AEA Technology QSA GmbH**

Typ
Type **PIR07012.**

Strahler-Nr.
Source number **GM 785**

Auftraggeber
Customer **AEA Technology QSA, Inc.
 USA-Burlington, MA 01803**

Auftragsnummer
Order No. **110746**

Anzahl der Seiten des Kalibrierscheines
Number of pages of the certificate **2**

Referenzdatum
Reference date **23 February 1999**

Dieser Kalibrierschein dokumentiert die Rückführung auf nationale Normale zur Darstellung der Einheiten in Übereinstimmung mit dem Internationalen Einheitensystem (SI).

Der Deutsche Kalibrierdienst ist Unterzeichner des multilateralen Übereinkommens der European cooperation for Accreditation of Laboratories (EAL) zur gegenseitigen Anerkennung der Kalibrierscheine.

Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich.

This calibration certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI).

The Deutscher Kalibrierdienst is signatory to the multilateral agreement of the European cooperation for Accreditation of Laboratories (EAL) for the mutual recognition of calibration certificates.

The user is obliged to have the object recalibrated at appropriate intervals.

Dieser Kalibrierschein darf nur vollständig und unverändert weiterverbreitet werden. Auszüge oder Änderungen bedürfen der Genehmigung sowohl der Physikalisch-Technischen Bundesanstalt als auch des ausstellenden Kalibrierlaboratoriums. Kalibrierscheine ohne Unterschrift und Stempel haben keine Gültigkeit.

This calibration certificate may not be reproduced other than in full except with the permission of both the Physikalisch-Technische Bundesanstalt and the issuing laboratory. Calibration certificates without signature and seal are not valid.

Stempel Seal	Datum Date	Leiter des Kalibrierlaboratoriums Head of the calibration laboratory	Stellvertreter Deputy	Bearbeiter Person in charge
	1 March 1999		Schott	
		Dr. Thieme	Schott	Linke / Schott / Schüler

Alpha Wide Area Reference Source

Source no.	GM 785
Drawing	VZ-628/1
Nuclide	Plutonium-239
Activity	40.1 Bq <i>0.00109 µCi</i>
Alpha surface emission rate	18.7 s ⁻¹ in 2 π steradian
Reference date	23 February 1999 at 12.00 GMT
Dimensions of active surface	150 mm x 100 mm
Overall dimensions	170 mm x 120 mm x 3 mm
Leakage and contamination test	The amount of the removable activity is less than 0.1 % of the total activity but does not exceed 200 Bq. (Wipe test according to ISO 9978, no. 5.3.1)
Date of wipe test	26 February 1999
Construction	Pu-239 is incorporated into the surface of an anodized aluminium foil of 0.3 mm thickness. The thickness of the activated layer is approx. 6 µm. The activated foil is mounted into a holder.
Measuring method	The activity was determined by comparison with a reference source of the same construction. The alpha surface emission rate was measured using a windowless proportional counter.
Traceability	Additional to the direct traceability to the PTB through the DKD this product complies with the requirements for traceability to NIST specified in the American National Standard "Traceability of Radioactive Sources to the NIST and Associated Instrument Quality Control (ANSI N42.22-1995)". As a requirement of the ANSI N42.22-1995 Amersham participates in the NEI/NIST Measurements Assurance Program of the Nuclear Power Industry.
Uncertainty	The relative uncertainty of the activity is 3 %, the relative uncertainty of the alpha surface emission rate is 5 %. The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95 %. (Ref. NIST Technical Note 1297/"Guide to the Expression of Uncertainty in Measurement" ISO Guide, 1995)
Radioactive impurities	Related to Pu-239 (equal 100 %) the following radioactive impurities were detected: none
Uniformity	The uniformity of the surface emission rate is better than 10 %.
Remark	According to ISO 8769 this is a Class 2 reference source.

Appendix C

**Analytical Laboratory Report
Requisition Number 16848**

ANALYTICAL REPORT

TO: JEFF LIVELY

PROJECT: 342303001

DATE: Monday, December 20, 1999

REQUISITION(S): 16848

PREPARED BY:

GRAND JUNCTION OFFICE ANALYTICAL LABORATORY
2597 B 3/4 ROAD
GRAND JUNCTION, COLORADO 81503
(970-248-6165)

ANALYTICAL REPORT INDEX

This report is the final data package for Requisition 16848 generated by the Analytical Laboratory for the Rocky Flats IVP project. It is the official record, and requestors are responsible for proper record-keeping in compliance with project requirements.

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, expressed or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, project, or process disclosed in this report, or represents that its use would not infringe privately owned rights. Reference therein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

CONTENTS

**Cover Page
Analytical Report Index
Analytical Summary
Sample Cross Reference**

**Section I
Analytical Data Summary and Quality Control Summary**

**Section II
Radiochemical Supporting Documentation**

**Section III
Receiving Documentation**

ANALYTICAL SUMMARY

This report contains the results for thirty-two smear samples and twenty-eight concrete samples received on November 29 and November 30, 1999, under Project No. 342303001 and Requisition No. 16848.

The determination of gross alpha activity was done by gas proportional counting according to the Grand Junction Office Analytical Laboratory Standard Operating Procedure (SOP) RC-8. Duplicate analysis results were obtained by counting the same sample twice.

Americium-241, plutonium isotopes, and uranium isotopes were analyzed by alpha spectrometry according to SOP RC-19.

All applicable laboratory quality control parameters were met.

RELEASE OF THE DATA CONTAINED IN THIS REPORT HAS BEEN AUTHORIZED
BY THE LABORATORY MANAGER OR THE MANAGER'S DESIGNEE

 12/21/99
LABORATORY MANAGER DATE

 12/21/99
PREPARED BY DATE

SAMPLE CROSS REFERENCE

V2.05

GRAND JUNCTION OFFICE ANALYTICAL LABORATORY

REQUISITION(S) : 16848

CUSTOMER ID	TICKET	LAB ID	CUSTOMER ID	TICKET	LAB ID
IVP0000271	SMR0000271	263797	IVP0000290	MED0000290	263935
IVP0000272	SMR0000272	263798	IVP0000291	MED0000291	263936
IVP0000273	SMR0000273	263799	IVP0000292	MED0000292	263937
IVP0000274	SMR0000274	263800	IVP0000293	MED0000293	263938
IVP0000275	SMR0000275	263801	IVP0000294	MED0000294	263939
IVP0000276	SMR0000276	263802	IVP0000295	MED0000295	263940
IVP0000277	SMR0000277	263803	IVP0000296	MED0000296	263941
IVP0000278	SMR0000278	263804	IVP0000297	MED0000297	263942
IVP0000279	SMR0000279	263805	IVP0000298	MED0000298	263943
IVP0000280	SMR0000280	263806	IVP0000299	MED0000299	263944
IVP0000281	SMR0000281	263807			
IVP0000282	SMR0000282	263808			
IVP0000283	SMR0000283	263809			
IVP0000284	SMR0000284	263810			
IVP0000285	SMR0000285	263811			
IVP0000286	SMR0000286	263812			
IVP0000287	SMR0000287	263813			
IVP0000288	SMR0000288	263814			
IVP0000289	SMR0000289	263815			
IVP0000290	SMR0000290	263816			
IVP0000291	SMR0000291	263817			
IVP0000292	SMR0000292	263818			
IVP0000293	SMR0000293	263819			
IVP0000294	SMR0000294	263820			
IVP0000295	SMR0000295	263821			
IVP0000296	SMR0000296	263822			
IVP0000297	SMR0000297	263823			
IVP0000298	SMR0000298	263824			
IVP0000299	SMR0000299	263825			
IVP0000597	SMR0000597	263826			
IVP0000598	SMR0000598	263827			
IVP0000599	SMR0000599	263828			
IVP0000271	MED0000271	263829			
IVP0000272	MED0000272	263830			
IVP0000273	MED0000273	263831			
IVP0000274	MED0000274	263832			
IVP0000275	MED0000275	263921			
IVP0000276	MED0000276	263922			
IVP0000277	MED0000277	263923			
IVP0000278	MED0000278	263924			
IVP0000279	MED0000279	263925			
IVP0000281	MED0000281	263926			
IVP0000282	MED0000282	263927			
IVP0000283	MED0000283	263928			
IVP0000284	MED0000284	263929			
IVP0000285	MED0000285	263930			
IVP0000286	MED0000286	263931			
IVP0000287	MED0000287	263932			
IVP0000288	MED0000288	263933			
IVP0000289	MED0000289	263934			

(SECTION I)

ANALYTICAL DATA SUMMARY

This section contains 70 pages, not including this page.

ANALYTICAL RESULTS

(SECTION I)

Customer ID: IVP0000271
Ticket ID: SMR0000271

Date: December 20, 1999
Lab ID: 263797

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 342303001

Case: 16848
Date Received: Nov 29, 1999
Date Collected: Nov 22, 1999

ANALYSIS REQUESTED	RESULTS QUALI's	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Gross Alpha	<4.76		12/07/99	RC-8 R03
Gross Beta	<7.98		12/07/99	RC-8 R03

Customer ID: IVP0000272
Ticket ID: SMR0000272

Date: December 20, 1999
Lab ID: 263798

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 342303001

Case: 16848
Date Received: Nov 29, 1999
Date Collected: Nov 22, 1999

ANALYSIS REQUESTED	RESULTS QUALI'S	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Gross Alpha	<4.65	NA DPM/SA	12/07/99	RC-8 R03
Gross Beta	<7.90	NA DPM/SA	12/07/99	RC-8 R03

ANALYTICAL RESULTS

(SECTION I)

Customer ID: IVP0000273
Ticket ID: SMR0000273

Date: December 20, 1999
Lab ID: 263799

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 342303001

Case: 16848
Date Received: Nov 29, 1999
Date Collected: Nov 22, 1999

ANALYSIS REQUESTED	RESULTS QUALI'S	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Gross Alpha	<4.66	NA DPM/SA	12/07/99	RC-8 R03
Gross Beta	<7.98	NA DPM/SA	12/07/99	RC-8 R03

ANALYTICAL RESULTS

(SECTION I)

Customer ID: IVP0000274
Ticket ID: SMR0000274

Date: December 20, 1999
Lab ID: 263800

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 342303001

Case: 16848
Date Received: Nov 29, 1999
Date Collected: Nov 22, 1999

ANALYSIS REQUESTED	RESULTS QUALI's	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Gross Alpha	<4.67	NA DPM/SA	12/07/99	RC-8 R03
Gross Beta	<8.02	NA DPM/SA	12/07/99	RC-8 R03

Customer ID: IVP0000275
Ticket ID: SMR0000275

Date: December 20, 1999
Lab ID: 263801

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 342303001

Case: 16848
Date Received: Nov 29, 1999
Date Collected: Nov 22, 1999

ANALYSIS REQUESTED	RESULTS QUALI's	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Gross Alpha	<4.64	NA DPM/SA	12/07/99	RC-8 R03
Gross Beta	<7.90	NA DPM/SA	12/07/99	RC-8 R03

ANALYTICAL RESULTS

(SECTION I)

Customer ID: IVP0000276
Ticket ID: SMR0000276

Date: December 20, 1999
Lab ID: 263802

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 342303001

Case: 16848
Date Received: Nov 29, 1999
Date Collected: Nov 22, 1999

ANALYSIS REQUESTED	RESULTS QUALI'S	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Gross Alpha	<4.64	NA DPM/SA	12/07/99	RC-8 R03
Gross Beta	<7.94	NA DPM/SA	12/07/99	RC-8 R03

Customer ID: IVP0000277
Ticket ID: SMR0000277

Date: December 20, 1999
Lab ID: 263803

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 342303001

Case: 16848
Date Received: Nov 29, 1999
Date Collected: Nov 22, 1999

ANALYSIS REQUESTED	RESULTS QUALI'S	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Gross Alpha	<4.63	NA DPM/SA	12/07/99	RC-8 R03
Gross Beta	<7.98	NA DPM/SA	12/07/99	RC-8 R03

Customer ID: IVP0000278
Ticket ID: SMR0000278

Date: December 20, 1999
Lab ID: 263804

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 342303001

Case: 16848
Date Received: Nov 29, 1999
Date Collected: Nov 22, 1999

ANALYSIS REQUESTED	RESULTS QUALI's	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Gross Alpha	<4.72		NA DPM/SA 12/07/99	RC-8 R03
Gross Beta	<7.90		NA DPM/SA 12/07/99	RC-8 R03

ANALYTICAL RESULTS

(SECTION I)

Customer ID: IVP0000279
Ticket ID: SMR0000279

Date: December 20, 1999
Lab ID: 263805

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 342303001

Case: 16848
Date Received: Nov 29, 1999
Date Collected: Nov 22, 1999

ANALYSIS REQUESTED	RESULTS QUALI's	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Gross Alpha	<4.67	NA DPM/SA	12/07/99	RC-8 R03
Gross Beta	<7.94	NA DPM/SA	12/07/99	RC-8 R03

ANALYTICAL RESULTS

(SECTION I)

Customer ID: IVP0000280
Ticket ID: SMR0000280

Date: December 20, 1999
Lab ID: 263806

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 342303001

Case: 16848
Date Received: Nov 29, 1999
Date Collected: Nov 22, 1999

ANALYSIS REQUESTED	RESULTS QUALI'S	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Gross Alpha	<4.69		NA DPM/SA 12/07/99	RC-8 R03
Gross Beta	<7.98		NA DPM/SA 12/07/99	RC-8 R03

ANALYTICAL RESULTS

(SECTION I)

Customer ID: IVP0000281
 Ticket ID: SMR0000281

Date: December 20, 1999
 Lab ID: 263807

Requestor: J. LIVELY
 Sample Matrix: SMEAR
 Project Number: 342303001

Case: 16848
 Date Received: Nov 29, 1999
 Date Collected: Nov 22, 1999

ANALYSIS REQUESTED	RESULTS QUALI'S	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Gross Alpha	<4.69	NA DPM/SA	12/07/99	RC-8 R03
Gross Beta	<8.02	NA DPM/SA	12/07/99	RC-8 R03

Customer ID: IVP0000282
Ticket ID: SMR0000282

Date: December 20, 1999
Lab ID: 263808

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 342303001

Case: 16848
Date Received: Nov 29, 1999
Date Collected: Nov 22, 1999

ANALYSIS REQUESTED	RESULTS QUALI'S	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Gross Alpha	<4.73	NA DPM/SA	12/07/99	RC-8 R03
Gross Beta	<7.98	NA DPM/SA	12/07/99	RC-8 R03

Customer ID: IVP0000283
Ticket ID: SMR0000283

Date: December 20, 1999
Lab ID: 263809

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 342303001

Case: 16848
Date Received: Nov 29, 1999
Date Collected: Nov 22, 1999

ANALYSIS REQUESTED	RESULTS QUALI'S	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Gross Alpha	<4.66	NA DPM/SA	12/07/99	RC-8 R03
Gross Beta	<7.94	NA DPM/SA	12/07/99	RC-8 R03

Customer ID: IVP0000284
Ticket ID: SMR0000284

Date: December 20, 1999
Lab ID: 263810

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 342303001

Case: 16848
Date Received: Nov 29, 1999
Date Collected: Nov 22, 1999

ANALYSIS REQUESTED	RESULTS QUALI'S	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Gross Alpha	<4.66	NA DPM/SA	12/07/99	RC-8 R03
Gross Beta	<7.94	NA DPM/SA	12/07/99	RC-8 R03

Customer ID: IVP0000285
Ticket ID: SMR0000285

Date: December 20, 1999
Lab ID: 263811

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 342303001

Case: 16848
Date Received: Nov 29, 1999
Date Collected: Nov 22, 1999

ANALYSIS REQUESTED	RESULTS QUALI'S	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Gross Alpha	<4.64	NA DPM/SA	12/07/99	RC-8 R03
Gross Beta	<7.90	NA DPM/SA	12/07/99	RC-8 R03

Customer ID: IVP0000286
Ticket ID: SMR0000286

Date: December 20, 1999
Lab ID: 263812

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 342303001

Case: 16848
Date Received: Nov 29, 1999
Date Collected: Nov 22, 1999

ANALYSIS REQUESTED	RESULTS QUALI's	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Gross Alpha	<4.67	NA	DPM/SA 12/07/99	RC-8 R03
Gross Beta	<7.94	NA	DPM/SA 12/07/99	RC-8 R03

ANALYTICAL RESULTS

(SECTION I)

Customer ID: IVP0000287
Ticket ID: SMR0000287

Date: December 20, 1999
Lab ID: 263813

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 342303001

Case: 16848
Date Received: Nov 29, 1999
Date Collected: Nov 22, 1999

ANALYSIS REQUESTED	RESULTS QUALI's	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Gross Alpha	<4.63	NA DPM/SA	12/07/99	RC-8 R03
Gross Beta	<7.90	NA DPM/SA	12/07/99	RC-8 R03

ANALYTICAL RESULTS

(SECTION I)

Customer ID: IVP0000288
Ticket ID: SMR0000288

Date: December 20, 1999
Lab ID: 263814

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 342303001

Case: 16848
Date Received: Nov 29, 1999
Date Collected: Nov 23, 1999

ANALYSIS REQUESTED	RESULTS QUALI'S	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Gross Alpha	<4.64	NA DPM/SA	12/07/99	RC-8 R03
Gross Beta	<7.90	NA DPM/SA	12/07/99	RC-8 R03

ANALYTICAL RESULTS

(SECTION I)

19

Customer ID: IVP0000289
 Ticket ID: SMR0000289

Date: December 20, 1999
 Lab ID: 263815

Requestor: J. LIVELY
 Sample Matrix: SMEAR
 Project Number: 342303001

Case: 16848
 Date Received: Nov 29, 1999
 Date Collected: Nov 23, 1999

ANALYSIS REQUESTED	RESULTS QUALI'S	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Gross Alpha	<4.64		NA DPM/SA 12/07/99	RC-8 R03
Gross Beta	<7.90		NA DPM/SA 12/07/99	RC-8 R03

ANALYTICAL RESULTS

(SECTION I)

20

Customer ID: IVP0000290
 Ticket ID: SMR0000290

Date: December 20, 1999
 Lab ID: 263816

Requestor: J. LIVELY
 Sample Matrix: SMEAR
 Project Number: 342303001

Case: 16848
 Date Received: Nov 29, 1999
 Date Collected: Nov 23, 1999

ANALYSIS REQUESTED	RESULTS QUALI's	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Gross Alpha	<4.62	NA DPM/SA	12/07/99	RC-8 R03
Gross Beta	<7.90	NA DPM/SA	12/07/99	RC-8 R03

ANALYTICAL RESULTS

(SECTION I)

21

Customer ID: IVP0000291
 Ticket ID: SMR0000291

Date: December 20, 1999
 Lab ID: 263817

Requestor: J. LIVELY
 Sample Matrix: SMEAR
 Project Number: 342303001

Case: 16848
 Date Received: Nov 29, 1999
 Date Collected: Nov 23, 1999

ANALYSIS REQUESTED	RESULTS QUALI's	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Gross Alpha	<4.69	NA DPM/SA	12/07/99	RC-8 R03
Gross Beta	<7.94	NA DPM/SA	12/07/99	RC-8 R03

ANALYTICAL RESULTS

(SECTION I)

22

Customer ID: IVP0000292

Ticket ID: SMR0000292

Date: December 20, 1999

Lab ID: 263818

Requestor: J. LIVELY

Sample Matrix: SMEAR

Project Number: 342303001

Case: 16848

Date Received: Nov 29, 1999

Date Collected: Nov 23, 1999

ANALYSIS REQUESTED	RESULTS QUALI'S	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Gross Alpha	<4.66	NA DPM/SA	12/07/99	RC-8 R03
Gross Beta	<7.90	NA DPM/SA	12/07/99	RC-8 R03

ANALYTICAL RESULTS

(SECTION I)

23

Customer ID: IVP0000293
 Ticket ID: SMR0000293

Date: December 20, 1999
 Lab ID: 263819

Requestor: J. LIVELY
 Sample Matrix: SMEAR
 Project Number: 342303001

Case: 16848
 Date Received: Nov 29, 1999
 Date Collected: Nov 23, 1999

ANALYSIS REQUESTED	RESULTS QUALI's	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Gross Alpha	<4.62		NA DPM/SA 12/07/99	RC-8 R03
Gross Beta	<7.90		NA DPM/SA 12/07/99	RC-8 R03

ANALYTICAL RESULTS

(SECTION I)

24

Customer ID: IVP0000294
Ticket ID: SMR0000294

Date: December 20, 1999
Lab ID: 263820

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 342303001

Case: 16848
Date Received: Nov 29, 1999
Date Collected: Nov 23, 1999

ANALYSIS REQUESTED	RESULTS QUALI'S	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Gross Alpha	<4.65	NA DPM/SA	12/07/99	RC-8 R03
Gross Beta	<7.98	NA DPM/SA	12/07/99	RC-8 R03

ANALYTICAL RESULTS

(SECTION I)

Customer ID: IVP0000295
Ticket ID: SMR0000295

Date: December 20, 1999
Lab ID: 263821

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 342303001

Case: 16848
Date Received: Nov 29, 1999
Date Collected: Nov 23, 1999

ANALYSIS REQUESTED	RESULTS QUALI's	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Gross Alpha	<4.61	NA DPM/SA	12/07/99	RC-8 R03
Gross Beta	<7.94	NA DPM/SA	12/07/99	RC-8 R03

ANALYTICAL RESULTS

(SECTION I)

Customer ID: IVP0000296
Ticket ID: SMR0000296

Date: December 20, 1999
Lab ID: 263822

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 342303001

Case: 16848
Date Received: Nov 29, 1999
Date Collected: Nov 23, 1999

ANALYSIS REQUESTED	RESULTS QUALI'S	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Gross Alpha	<4.63	NA DPM/SA	12/07/99	RC-8 R03
Gross Beta	<7.90	NA DPM/SA	12/07/99	RC-8 R03

Customer ID: IVP0000297
Ticket ID: SMR0000297

Date: December 20, 1999
Lab ID: 263823

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 342303001

Case: 16848
Date Received: Nov 29, 1999
Date Collected: Nov 23, 1999

ANALYSIS REQUESTED	RESULTS QUALI's	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Gross Alpha	<4.68	NA DPM/SA	12/07/99	RC-8 R03
Gross Beta	<7.90	NA DPM/SA	12/07/99	RC-8 R03

ANALYTICAL RESULTS

(SECTION I)

Customer ID: IVP0000298
 Ticket ID: SMR0000298

Date: December 20, 1999
 Lab ID: 263824

Requestor: J. LIVELY
 Sample Matrix: SMEAR
 Project Number: 342303001

Case: 16848
 Date Received: Nov 29, 1999
 Date Collected: Nov 23, 1999

ANALYSIS REQUESTED	RESULTS QUALI'S	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Gross Alpha	<4.70	NA DPM/SA	12/07/99	RC-8 R03
Gross Beta	<7.94	NA DPM/SA	12/07/99	RC-8 R03

ANALYTICAL RESULTS

(SECTION I)

29

Customer ID: IVP0000299
Ticket ID: SMR0000299

Date: December 20, 1999
Lab ID: 263825

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 342303001

Case: 16848
Date Received: Nov 29, 1999
Date Collected: Nov 23, 1999

ANALYSIS REQUESTED	RESULTS QUALI's	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Gross Alpha	<4.63	NA DPM/SA	12/07/99	RC-8 R03
Gross Beta	<7.90	NA DPM/SA	12/07/99	RC-8 R03

ANALYTICAL RESULTS

(SECTION I)

30

Customer ID: IVP0000597
 Ticket ID: SMR0000597

Date: December 20, 1999
 Lab ID: 263826

Requestor: J. LIVELY
 Sample Matrix: SMEAR
 Project Number: 342303001

Case: 16848
 Date Received: Nov 29, 1999
 Date Collected: Nov 23, 1999

ANALYSIS REQUESTED	RESULTS QUALI'S	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Gross Alpha	52.03	12.49 DPM/SA	12/07/99	RC-8 R03
Gross Beta	13.59	7.57 DPM/SA	12/07/99	RC-8 R03

ANALYTICAL RESULTS

(SECTION I)

31

Customer ID: IVP0000598
Ticket ID: SMR0000598

Date: December 20, 1999
Lab ID: 263827

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 342303001

Case: 16848
Date Received: Nov 29, 1999
Date Collected: Nov 23, 1999

ANALYSIS REQUESTED	RESULTS QUALI'S	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Gross Alpha	<4.73	NA DPM/SA	12/07/99	RC-8 R03
Gross Beta	<7.98	NA DPM/SA	12/07/99	RC-8 R03

ANALYTICAL RESULTS

(SECTION I)

32

Customer ID: IVP0000599
Ticket ID: SMR0000599

Date: December 20, 1999
Lab ID: 263828

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 342303001

Case: 16848
Date Received: Nov 29, 1999
Date Collected: Nov 23, 1999

ANALYSIS REQUESTED	RESULTS QUALI'S	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Gross Alpha	<4.65	NA DPM/SA	12/07/99	RC-8 R03
Gross Beta	<7.94	NA DPM/SA	12/07/99	RC-8 R03

ANALYTICAL RESULTS

(SECTION I)

33

Customer ID: IVP0000271
 Ticket ID: MED0000271

Date: December 20, 1999
 Lab ID: 263829

Requestor: J. LIVELY
 Sample Matrix: MILLED CONCRETE
 Project Number: 342303001

Case: 16848
 Date Received: Nov 29, 1999
 Date Collected: Nov 23, 1999

ANALYSIS REQUESTED	RESULTS QUALI's	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Americium-241	0.2043	0.0673 pCi/g	12/09/99	RC-19 R06
Pu-239+240	0.3872	0.0954 pCi/g	12/07/99	RC-19 R06
Plutonium-238	<0.0361	NA pCi/g	12/07/99	RC-19 R06
Uranium-238	0.4786	0.0979 pCi/g	12/01/99	RC-19 R06
Uranium-235	<0.0634	NA pCi/g	12/01/99	RC-19 R06
Uranium-234	0.3612	0.0855 pCi/g	12/01/99	RC-19 R06

ANALYTICAL RESULTS

(SECTION I)

34

Customer ID: IVP0000272
 Ticket ID: MED0000272

Date: December 20, 1999
 Lab ID: 263830

Requestor: J. LIVELY
 Sample Matrix: MILLED CONCRETE
 Project Number: 342303001

Case: 16848
 Date Received: Nov 29, 1999
 Date Collected: Nov 23, 1999

ANALYSIS REQUESTED	RESULTS QUALI's	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Americium-241	0.6603	0.1124 pCi/g	12/09/99	RC-19 R06
Pu-239+240	2.08	0.2133 pCi/g	12/14/99	RC-19 R06
Plutonium-238	<0.0216	NA pCi/g	12/14/99	RC-19 R06
Uranium-238	1.16	0.1403 pCi/g	12/01/99	RC-19 R06
Uranium-235	<0.0643	NA pCi/g	12/01/99	RC-19 R06
Uranium-234	1.22	0.1448 pCi/g	12/01/99	RC-19 R06

ANALYTICAL RESULTS

(SECTION I)

35

Customer ID: IVP0000273
 Ticket ID: MED0000273

Date: December 20, 1999
 Lab ID: 263831

Requestor: J. LIVELY
 Sample Matrix: MILLED CONCRETE
 Project Number: 342303001

Case: 16848
 Date Received: Nov 29, 1999
 Date Collected: Nov 23, 1999

ANALYSIS REQUESTED	RESULTS QUALI'S	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Americium-241	7.08	0.5245 pCi/g	12/09/99	RC-19 R06
Pu-239+240	11.93	0.7908 pCi/g	12/07/99	RC-19 R06
Plutonium-238	<0.0214	NA pCi/g	12/07/99	RC-19 R06
Uranium-238	1.49	0.1587 pCi/g	12/01/99	RC-19 R06
Uranium-235	0.0696	0.0356 pCi/g	12/01/99	RC-19 R06
Uranium-234	1.64	0.1692 pCi/g	12/01/99	RC-19 R06

ANALYTICAL RESULTS

Customer ID: IVP0000274

Ticket ID: MED0000274

Date: December 20, 1999

Lab ID: 263832

Requestor: J. LIVELY

Sample Matrix: MILLED CONCRETE

Project Number: 342303001

Case: 16848

Date Received: Nov 29, 1999

Date Collected: Nov 23, 1999

ANALYSIS REQUESTED	RESULTS QUALI'S	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Americium-241	3.30	0.3115 pCi/g	12/09/99	RC-19 R06
Pu-239+240	6.78	0.5058 pCi/g	12/07/99	RC-19 R06
Plutonium-238	<0.0108	NA pCi/g	12/07/99	RC-19 R06
Uranium-238	1.41	0.1584 pCi/g	12/01/99	RC-19 R06
Uranium-235	0.4465	0.0929 pCi/g	12/01/99	RC-19 R06
Uranium-234	1.61	0.1727 pCi/g	12/01/99	RC-19 R06

ANALYTICAL RESULTS

(SECTION I)

37

Customer ID: IVP0000275
 Ticket ID: MED0000275

Date: December 20, 1999
 Lab ID: 263921

Requestor: J. LIVELY
 Sample Matrix: MILLED CONCRETE
 Project Number: 342303001

Case: 16848
 Date Received: Nov 30, 1999
 Date Collected: Nov 29, 1999

ANALYSIS REQUESTED	RESULTS QUALI'S	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Americium-241	2.34	1.2920 dpm/SA	12/10/99	RC-19 R06
Pu-239+240	11.97	2.5810 dpm/SA	12/07/99	RC-19 R06
Plutonium-238	<0.3467	NA dpm/SA	12/07/99	RC-19 R06
Uranium-238	23.25	3.2290 dpm/SA	12/01/99	RC-19 R06
Uranium-235	1.64	0.9373 dpm/SA	12/01/99	RC-19 R06
Uranium-234	22.39	3.1990 dpm/SA	12/01/99	RC-19 R06

Customer ID: IVP0000276
Ticket ID: MED0000276

Date: December 20, 1999
Lab ID: 263922

Requestor: J. LIVELY
Sample Matrix: MILLED CONCRETE
Project Number: 342303001

Case: 16848
Date Received: Nov 30, 1999
Date Collected: Nov 29, 1999

ANALYSIS REQUESTED	RESULTS QUALI'S	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Americium-241	2.99	1.1620 dpm/SA	12/16/99	RC-19 R06
Pu-239+240	128.9	10.5500 dpm/SA	12/07/99	RC-19 R06
Plutonium-238	2.24	1.0080 dpm/SA	12/07/99	RC-19 R06
Uranium-238	16.19	2.3980 dpm/SA	12/01/99	RC-19 R06
Uranium-235	<0.9550	NA dpm/SA	12/01/99	RC-19 R06
Uranium-234	16.66	2.4620 dpm/SA	12/01/99	RC-19 R06

ANALYTICAL RESULTS

(SECTION I)

39

Customer ID: IVP0000277
 Ticket ID: MED0000277

Date: December 20, 1999
 Lab ID: 263923

Requestor: J. LIVELY
 Sample Matrix: MILLED CONCRETE
 Project Number: 342303001

Case: 16848
 Date Received: Nov 30, 1999
 Date Collected: Nov 29, 1999

ANALYSIS REQUESTED	RESULTS QUALI's	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Americium-241	0.9144	0.6115 dpm/SA	12/16/99	RC-19 R06
Pu-239+240	2.10	1.1100 dpm/SA	12/07/99	RC-19 R06
Plutonium-238	<1.0980	NA dpm/SA	12/07/99	RC-19 R06
Uranium-238	21.74	3.3840 dpm/SA	12/01/99	RC-19 R06
Uranium-235	<1.2980	NA dpm/SA	12/01/99	RC-19 R06
Uranium-234	15.91	2.8740 dpm/SA	12/01/99	RC-19 R06

ANALYTICAL RESULTS

(SECTION I)

40

Customer ID: IVP0000278
 Ticket ID: MED0000278

Date: December 20, 1999
 Lab ID: 263924

Requestor: J. LIVELY
 Sample Matrix: MILLED CONCRETE
 Project Number: 342303001

Case: 16848
 Date Received: Nov 30, 1999
 Date Collected: Nov 29, 1999

ANALYSIS REQUESTED	RESULTS QUALI'S	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Americium-241	9.01	2.2690 dpm/SA	12/16/99	RC-19 R06
Pu-239+240	10.23	2.5090 dpm/SA	12/07/99	RC-19 R06
Plutonium-238	<0.7919	NA dpm/SA	12/07/99	RC-19 R06
Uranium-238	19.55	3.3000 dpm/SA	12/01/99	RC-19 R06
Uranium-235	2.27	1.2840 dpm/SA	12/01/99	RC-19 R06
Uranium-234	20.12	3.3580 dpm/SA	12/01/99	RC-19 R06

ANALYTICAL RESULTS

(SECTION I)

41

Customer ID: IVP0000279
 Ticket ID: MED0000279

Date: December 20, 1999
 Lab ID: 263925

Requestor: J. LIVELY
 Sample Matrix: MILLED CONCRETE
 Project Number: 342303001

Case: 16848
 Date Received: Nov 30, 1999
 Date Collected: Nov 29, 1999

ANALYSIS REQUESTED	RESULTS QUALI's	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Americium-241	1.92	1.1590 dpm/SA	12/09/99	RC-19 R06
Pu-239+240	2.07	1.0730 dpm/SA	12/07/99	RC-19 R06
Plutonium-238	2.59	1.2550 dpm/SA	12/07/99	RC-19 R06
Uranium-238	31.87	4.1540 dpm/SA	12/01/99	RC-19 R06
Uranium-235	<1.6910	NA dpm/SA	12/01/99	RC-19 R06
Uranium-234	32.12	4.1800 dpm/SA	12/01/99	RC-19 R06

ANALYTICAL RESULTS

(SECTION I)

42

Customer ID: IVP0000281
 Ticket ID: MED0000281

Date: December 20, 1999
 Lab ID: 263926

Requestor: J. LIVELY
 Sample Matrix: MILLED CONCRETE
 Project Number: 342303001

Case: 16848
 Date Received: Nov 30, 1999
 Date Collected: Nov 29, 1999

ANALYSIS REQUESTED	RESULTS QUALI'S	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Americium-241	<0.9228	NA dpm/SA	12/09/99	RC-19 R06
Pu-239+240	<0.8883	NA dpm/SA	12/07/99	RC-19 R06
Plutonium-238	<0.2428	NA dpm/SA	12/07/99	RC-19 R06
Uranium-238	21.56	2.7740 dpm/SA	12/01/99	RC-19 R06
Uranium-235	<1.0410	NA dpm/SA	12/01/99	RC-19 R06
Uranium-234	18.00	2.4990 dpm/SA	12/01/99	RC-19 R06

ANALYTICAL RESULTS

(SECTION I)

43

Customer ID: IVP0000282
Ticket ID: MED0000282

Date: December 20, 1999
Lab ID: 263927

Requestor: J. LIVELY
Sample Matrix: MILLED CONCRETE
Project Number: 342303001

Case: 16848
Date Received: Nov 30, 1999
Date Collected: Nov 29, 1999

ANALYSIS REQUESTED	RESULTS QUALI's	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Americium-241	<0.5482		NA dpm/SA 12/09/99	RC-19 R06
Pu-239+240	1.33	0.7545	dpm/SA 12/07/99	RC-19 R06
Plutonium-238	<0.5198		NA dpm/SA 12/07/99	RC-19 R06
Uranium-238	17.37	2.4240	dpm/SA 12/01/99	RC-19 R06
Uranium-235	1.40	0.9148	dpm/SA 12/01/99	RC-19 R06
Uranium-234	19.08	2.5490	dpm/SA 12/01/99	RC-19 R06

Customer ID: IVP0000283
Ticket ID: MED0000283

Date: December 20, 1999
Lab ID: 263928

Requestor: J. LIVELY
Sample Matrix: MILLED CONCRETE
Project Number: 342303001

Case: 16848
Date Received: Nov 30, 1999
Date Collected: Nov 29, 1999

ANALYSIS REQUESTED	RESULTS QUALI'S	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Americium-241	<1.0540	NA dpm/SA	12/09/99	RC-19 R06
Pu-239+240	2.30	1.1130 dpm/SA	12/07/99	RC-19 R06
Plutonium-238	<0.6712	NA dpm/SA	12/07/99	RC-19 R06
Uranium-238	41.56	4.6840 dpm/SA	12/01/99	RC-19 R06
Uranium-235	3.52	1.4920 dpm/SA	12/01/99	RC-19 R06
Uranium-234	41.22	4.6570 dpm/SA	12/01/99	RC-19 R06

ANALYTICAL RESULTS

(SECTION I)

45

Customer ID: IVP0000284
 Ticket ID: MED0000284

Date: December 20, 1999
 Lab ID: 263929

Requestor: J. LIVELY
 Sample Matrix: MILLED CONCRETE
 Project Number: 342303001

Case: 16848
 Date Received: Nov 30, 1999
 Date Collected: Nov 29, 1999

ANALYSIS REQUESTED	RESULTS QUALI'S	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Americium-241	1.15	0.9331 dpm/SA	12/09/99	RC-19 R06
Pu-239+240	1.46	1.0650 dpm/SA	12/07/99	RC-19 R06
Plutonium-238	<1.2140	NA dpm/SA	12/07/99	RC-19 R06
Uranium-238	36.69	4.8010 dpm/SA	12/01/99	RC-19 R06
Uranium-235	<2.1520	NA dpm/SA	12/01/99	RC-19 R06
Uranium-234	39.00	4.9970 dpm/SA	12/01/99	RC-19 R06

ANALYTICAL RESULTS

(SECTION I)

46

Customer ID: IVP0000285
 Ticket ID: MED0000285

Date: December 20, 1999
 Lab ID: 263930

Requestor: J. LIVELY
 Sample Matrix: MILLED CONCRETE
 Project Number: 342303001

Case: 16848
 Date Received: Nov 30, 1999
 Date Collected: Nov 29, 1999

ANALYSIS REQUESTED	RESULTS QUALI'S	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Americium-241	0.8129	0.5415 dpm/SA	12/10/99	RC-19 R06
Pu-239+240	<0.5221	NA dpm/SA	12/07/99	RC-19 R06
Plutonium-238	<0.9159	NA dpm/SA	12/07/99	RC-19 R06
Uranium-238	19.59	2.6550 dpm/SA	12/01/99	RC-19 R06
Uranium-235	<1.1550	NA dpm/SA	12/01/99	RC-19 R06
Uranium-234	17.96	2.5140 dpm/SA	12/01/99	RC-19 R06

ANALYTICAL RESULTS

(SECTION I)

47

Customer ID: IVP0000286
 Ticket ID: MED0000286

Date: December 20, 1999
 Lab ID: 263931

Requestor: J. LIVELY
 Sample Matrix: MILLED CONCRETE
 Project Number: 342303001

Case: 16848
 Date Received: Nov 30, 1999
 Date Collected: Nov 29, 1999

ANALYSIS REQUESTED	RESULTS	QUALI'S	ERROR	UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Americium-241	<0.6265		NA	dpm/SA	12/10/99	RC-19 R06
Pu-239+240	<0.4750		NA	dpm/SA	12/08/99	RC-19 R06
Plutonium-238	<0.3907		NA	dpm/SA	12/08/99	RC-19 R06
Uranium-238	19.29		2.3220	dpm/SA	12/08/99	RC-19 R06
Uranium-235	1.19		0.7104	dpm/SA	12/08/99	RC-19 R06
Uranium-234	16.82		2.1590	dpm/SA	12/08/99	RC-19 R06

ANALYTICAL RESULTS

(SECTION I)

48

Customer ID: IVP0000287
 Ticket ID: MED0000287

Date: December 20, 1999
 Lab ID: 263932

Requestor: J. LIVELY
 Sample Matrix: MILLED CONCRETE
 Project Number: 342303001

Case: 16848
 Date Received: Nov 30, 1999
 Date Collected: Nov 29, 1999

ANALYSIS REQUESTED	RESULTS QUALI'S	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Americium-241	0.7422 U	0.6650 dpm/SA	12/10/99	RC-19 R06
Pu-239+240	<1.6020	NA dpm/SA	12/08/99	RC-19 R06
Plutonium-238	<0.9130	NA dpm/SA	12/08/99	RC-19 R06
Uranium-238	28.78	4.1800 dpm/SA	12/08/99	RC-19 R06
Uranium-235	1.76	1.1550 dpm/SA	12/08/99	RC-19 R06
Uranium-234	31.94	4.4840 dpm/SA	12/08/99	RC-19 R06

ANALYTICAL RESULTS

(SECTION I)

49

Customer ID: IVP0000288
 Ticket ID: MED0000288

Date: December 20, 1999
 Lab ID: 263933

Requestor: J. LIVELY
 Sample Matrix: MILLED CONCRETE
 Project Number: 342303001

Case: 16848
 Date Received: Nov 30, 1999
 Date Collected: Nov 29, 1999

ANALYSIS REQUESTED	RESULTS QUALI'S	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Americium-241	<0.5745	NA dpm/SA	12/10/99	RC-19 R06
Pu-239+240	<0.8220	NA dpm/SA	12/08/99	RC-19 R06
Plutonium-238	<0.5952	NA dpm/SA	12/08/99	RC-19 R06
Uranium-238	26.39	3.3420 dpm/SA	12/08/99	RC-19 R06
Uranium-235	<1.0800	NA dpm/SA	12/08/99	RC-19 R06
Uranium-234	23.60	3.1590 dpm/SA	12/08/99	RC-19 R06

ANALYTICAL RESULTS

(SECTION I)

50

Customer ID: IVP0000289

Date: December 20, 1999

Ticket ID: MED0000289

Lab ID: 263934

Requestor: J. LIVELY

Case: 16848

Sample Matrix: MILLED CONCRETE

Date Received: Nov 30, 1999

Project Number: 342303001

Date Collected: Nov 29, 1999

ANALYSIS REQUESTED	RESULTS QUALI'S	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Americium-241	0.8469	0.6883 dpm/SA	12/10/99	RC-19 R06
Pu-239+240	<0.7012	NA dpm/SA	12/08/99	RC-19 R06
Plutonium-238	<0.3363	NA dpm/SA	12/08/99	RC-19 R06
Uranium-238	23.68	3.2410 dpm/SA	12/08/99	RC-19 R06
Uranium-235	1.39	0.8965 dpm/SA	12/08/99	RC-19 R06
Uranium-234	22.54	3.1670 dpm/SA	12/08/99	RC-19 R06

ANALYTICAL RESULTS

(SECTION I)

51

Customer ID: IVP0000290
 Ticket ID: MED0000290

Date: December 20, 1999
 Lab ID: 263935

Requestor: J. LIVELY
 Sample Matrix: MILLED CONCRETE
 Project Number: 342303001

Case: 16848
 Date Received: Nov 30, 1999
 Date Collected: Nov 29, 1999

ANALYSIS REQUESTED	RESULTS QUALI's	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Americium-241	0.9818	0.7979 dpm/SA	12/10/99	RC-19 R06
Pu-239+240	<1.3090	NA dpm/SA	12/08/99	RC-19 R06
Plutonium-238	<0.8573	NA dpm/SA	12/08/99	RC-19 R06
Uranium-238	28.00	3.7650 dpm/SA	12/08/99	RC-19 R06
Uranium-235	1.98	1.1180 dpm/SA	12/08/99	RC-19 R06
Uranium-234	25.66	3.5920 dpm/SA	12/08/99	RC-19 R06

1.01

ANALYTICAL RESULTS

(SECTION I)

52

Customer ID: IVP0000291
 Ticket ID: MED0000291

Date: December 20, 1999
 Lab ID: 263936

Requestor: J. LIVELY
 Sample Matrix: MILLED CONCRETE
 Project Number: 342303001

Case: 16848
 Date Received: Nov 30, 1999
 Date Collected: Nov 29, 1999

ANALYSIS REQUESTED	RESULTS QUALI's	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Americium-241	<0.7284	NA dpm/SA	12/10/99	RC-19 R06
Pu-239+240	<0.9952	NA dpm/SA	12/08/99	RC-19 R06
Plutonium-238	<0.9952	NA dpm/SA	12/08/99	RC-19 R06
Uranium-238	22.31	2.9310 dpm/SA	12/08/99	RC-19 R06
Uranium-235	<1.2010	NA dpm/SA	12/08/99	RC-19 R06
Uranium-234	21.67	2.8880 dpm/SA	12/08/99	RC-19 R06

ANALYTICAL RESULTS

(SECTION I)

53

Customer ID: IVP0000292
 Ticket ID: MED0000292

Date: December 20, 1999
 Lab ID: 263937

Requestor: J. LIVELY
 Sample Matrix: MILLED CONCRETE
 Project Number: 342303001

Case: 16848
 Date Received: Nov 30, 1999
 Date Collected: Nov 29, 1999

ANALYSIS REQUESTED	RESULTS QUALI's	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Americium-241	<0.7629	NA dpm/SA	12/10/99	RC-19 R06
Pu-239+240	<0.9233	NA dpm/SA	12/08/99	RC-19 R06
Plutonium-238	<0.5618	NA dpm/SA	12/08/99	RC-19 R06
Uranium-238	28.41	3.6370 dpm/SA	12/08/99	RC-19 R06
Uranium-235	<1.3530	NA dpm/SA	12/08/99	RC-19 R06
Uranium-234	27.20	3.5410 dpm/SA	12/08/99	RC-19 R06

ANALYTICAL RESULTS

(SECTION I)

54

Customer ID: IVP0000293
 Ticket ID: MED0000293

Date: December 20, 1999
 Lab ID: 263938

Requestor: J. LIVELY
 Sample Matrix: MILLED CONCRETE
 Project Number: 342303001

Case: 16848
 Date Received: Nov 30, 1999
 Date Collected: Nov 29, 1999

ANALYSIS REQUESTED	RESULTS QUALI'S	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Americium-241	0.6567	0.4904 dpm/SA	12/11/99	RC-19 R06
Pu-239+240	0.1755	0.2029 dpm/SA	12/08/99	RC-19 R06
Plutonium-238	<0.4565	NA dpm/SA	12/08/99	RC-19 R06
Uranium-238	14.55	1.9980 dpm/SA	12/08/99	RC-19 R06
Uranium-235	1.28	0.7695 dpm/SA	12/08/99	RC-19 R06
Uranium-234	13.64	1.9210 dpm/SA	12/08/99	RC-19 R06

ANALYTICAL RESULTS

(SECTION I)

55

Customer ID: IVP0000294
 Ticket ID: MED0000294

Date: December 20, 1999
 Lab ID: 263939

Requestor: J. LIVELY
 Sample Matrix: MILLED CONCRETE
 Project Number: 342303001

Case: 16848
 Date Received: Nov 30, 1999
 Date Collected: Nov 29, 1999

ANALYSIS REQUESTED	RESULTS QUALI's	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Americium-241	0.6584	0.5350 dpm/SA	12/11/99	RC-19 R06
Pu-239+240	<0.9944	NA dpm/SA	12/08/99	RC-19 R06
Plutonium-238	<0.5357	NA dpm/SA	12/08/99	RC-19 R06
Uranium-238	20.04	2.9060 dpm/SA	12/08/99	RC-19 R06
Uranium-235	<1.9040	NA dpm/SA	12/08/99	RC-19 R06
Uranium-234	20.87	2.8970 dpm/SA	12/08/99	RC-19 R06

Customer ID: IVP0000295
Ticket ID: MED0000295

Date: December 20, 1999
Lab ID: 263940

Requestor: J. LIVELY
Sample Matrix: MILLED CONCRETE
Project Number: 342303001

Case: 16848
Date Received: Nov 30, 1999
Date Collected: Nov 29, 1999

ANALYSIS REQUESTED	RESULTS QUALI'S	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Americium-241	0.5887	0.4156 dpm/SA	12/11/99	RC-19 R06
Pu-239+240	<0.5788	NA dpm/SA	12/08/99	RC-19 R06
Plutonium-238	<0.3807	NA dpm/SA	12/08/99	RC-19 R06
Uranium-238	15.74	2.0740 dpm/SA	12/08/99	RC-19 R06
Uranium-235	0.9710	0.6481 dpm/SA	12/08/99	RC-19 R06
Uranium-234	17.77	2.2350 dpm/SA	12/08/99	RC-19 R06

ANALYTICAL RESULTS

(SECTION I)

57

Customer ID: IVP0000296
Ticket ID: MED0000296

Date: December 20, 1999
Lab ID: 263941

Requestor: J. LIVELY
Sample Matrix: MILLED CONCRETE
Project Number: 342303001

Case: 16848
Date Received: Nov 30, 1999
Date Collected: Nov 29, 1999

ANALYSIS REQUESTED	RESULTS QUALI'S	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Americium-241	0.5638	0.5052 dpm/SA	12/11/99	RC-19 R06
Pu-239+240	<0.9223	NA dpm/SA	12/08/99	RC-19 R06
Plutonium-238	<0.7373	NA dpm/SA	12/08/99	RC-19 R06
Uranium-238	22.23	3.1890 dpm/SA	12/09/99	RC-19 R06
Uranium-235	1.62	1.0420 dpm/SA	12/09/99	RC-19 R06
Uranium-234	25.87	3.4860 dpm/SA	12/09/99	RC-19 R06

ANALYTICAL RESULTS

(SECTION I)

58

Customer ID: IVP0000297
 Ticket ID: MED0000297

Date: December 20, 1999
 Lab ID: 263942

Requestor: J. LIVELY
 Sample Matrix: MILLED CONCRETE
 Project Number: 342303001

Case: 16848
 Date Received: Nov 30, 1999
 Date Collected: Nov 29, 1999

ANALYSIS REQUESTED	RESULTS QUALI's	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Americium-241	0.5630	0.5639 dpm/SA	12/11/99	RC-19 R06
Pu-239+240	<0.9879	NA dpm/SA	12/08/99	RC-19 R06
Plutonium-238	<0.8973	NA dpm/SA	12/08/99	RC-19 R06
Uranium-238	22.32	3.1800 dpm/SA	12/09/99	RC-19 R06
Uranium-235	<1.8120	NA dpm/SA	12/09/99	RC-19 R06
Uranium-234	21.37	3.1280 dpm/SA	12/09/99	RC-19 R06

ANALYTICAL RESULTS

(SECTION I)

59

Customer ID: IVP0000298
 Ticket ID: MED0000298

Date: December 20, 1999
 Lab ID: 263943

Requestor: J. LIVELY
 Sample Matrix: MILLED CONCRETE
 Project Number: 342303001

Case: 16848
 Date Received: Nov 30, 1999
 Date Collected: Nov 29, 1999

ANALYSIS REQUESTED	RESULTS QUALI'S	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Americium-241	<0.5636		NA dpm/SA 12/11/99	RC-19 R06
Pu-239+240	0.6371	0.4497	dpm/SA 12/08/99	RC-19 R06
Plutonium-238	<0.5781		NA dpm/SA 12/08/99	RC-19 R06
Uranium-238	18.06	2.4120	dpm/SA 12/09/99	RC-19 R06
Uranium-235	1.05	0.6487	dpm/SA 12/09/99	RC-19 R06
Uranium-234	18.02	2.4230	dpm/SA 12/09/99	RC-19 R06

Customer ID: IVP0000299
 Ticket ID: MED0000299

Date: December 20, 1999
 Lab ID: 263944

Requestor: J. LIVELY
 Sample Matrix: MILLED CONCRETE
 Project Number: 342303001

Case: 16848
 Date Received: Nov 30, 1999
 Date Collected: Nov 29, 1999

ANALYSIS REQUESTED	RESULTS QUALI's	ERROR UNITS	DATE ANALYZED	METHOD OF ANALYSIS
Americium-241	<1.2290	NA dpm/SA	12/11/99	RC-19 R06
Pu-239+240	<1.2100	NA dpm/SA	12/08/99	RC-19 R06
Plutonium-238	<0.8763	NA dpm/SA	12/08/99	RC-19 R06
Uranium-238	32.61	4.1060 dpm/SA	12/09/99	RC-19 R06
Uranium-235	<1.8710	NA dpm/SA	12/09/99	RC-19 R06
Uranium-234	34.28	4.2560 dpm/SA	12/09/99	RC-19 R06

QUALITY CONTROL SUMMARY

Lab Name: GJO Analytical Laboratory

CASE: 16848

Analyte	Date	Result	Known Value	Units	Acceptance	
					Low	High
Gross Alpha	12/07/99	208.85	214	PCI/SA		
Gross Alpha	12/07/99	192.31	214	PCI/SA		
Gross Beta	12/07/99	237.66	230	PCI/SA		
Gross Beta	12/07/99	230.55	230	PCI/SA		

COMMENTS:

163

Lab Name: GJO Analytical Laboratory

CASE: 16848

Analyte	Date	Result	Known Value	Units	Acceptance	
					Low	High
Uranium-234	12/01/99	16.43	16.6	pCi/L	14.48	18.04
Uranium-234	12/09/99	16.77	16.6	pCi/L	14.48	18.04
Uranium-235	12/01/99	0.9948	0.77	pCi/L	0.33	1.22
Uranium-235	12/09/99	0.8396	0.77	pCi/L	0.33	1.22
Uranium-238	12/01/99	15.50	16.6	pCi/L	14.59	17.87
Uranium-238	12/09/99	16.48	16.6	pCi/L	14.59	17.87

COMMENTS:

164

Lab Name: GJO Analytical Laboratory

CASE: 16848

Analyte	Date	Result	Known Value	Units	Acceptance	
					Low	High
Americium-241	12/10/99	4.49	4.74	pCi/mL	4.05	5.18
Americium-241	12/11/99	4.57	4.74	pCi/mL	4.05	5.18
Americium-241	12/16/99	4.72	4.74	pCi/mL	4.05	5.18
Plutonium-238	12/08/99	10.22	10.67	pCi/mL	9.36	11.52
Plutonium-238	12/09/99	10.53	10.67	pCi/mL	9.36	11.52
Plutonium-238	12/14/99	10.55	10.67	pCi/mL	9.36	11.52
Pu-239+240	12/08/99	10.64	10.5	pCi/mL	9.57	11.70
Pu-239+240	12/09/99	10.30	10.5	pCi/mL	9.57	11.70
Pu-239+240	12/14/99	11.42	10.5	pCi/mL	9.57	11.70

COMMENTS:

165

Lab Name: GJO Analytical Laboratory

(SECTION I)

CASE: 16848

SAMPLE: 263797

Analyte	Date	Acceptance		Sample Result	Replicat Result	Units	%RPD
		Low	High				
Gross Alpha	12/07/99			1.04	0.31	DPM/SA	-108.15
Gross Beta	12/07/99			6.60	4.41	DPM/SA	-39.78

COMMENTS:

166

REPLICATE SAMPLE QC REPORT

V1.02 66

Lab Name: GJO Analytical Laboratory

(SECTION I)

CASE: 16848

SAMPLE: 263814

Analyte	Date	Acceptance		Sample Result	Replicat Result	Units	%RPD
		Low	High				
Gross Alpha	12/07/99			-0.42	0.33	DPM/SA	-1666.67
Gross Beta	12/07/99			-0.02	0.50	DPM/SA	216.67

COMMENTS:

REPLICATE SAMPLE QC REPORT

V1.02 67

Lab Name: GJO Analytical Laboratory

(SECTION I)

CASE: 16848

SAMPLE: 263921

Analyte	Date	Acceptance		Sample Result	Replicat Result	Units	%RPD
		Low	High				
Mercurium-241	12/10/99			2.34	1.52	dpm/SA	-42.49
Plutonium-238	12/07/99			0.1280	0.0755	dpm/SA	-51.60
Am-239+240	12/07/99			11.97	6.64	dpm/SA	-57.28
Uranium-234	12/01/99			22.39	27.03	dpm/SA	18.78
Uranium-235	12/01/99			1.64	1.26	dpm/SA	-26.21
Uranium-238	12/01/99			23.25	27.32	dpm/SA	16.10

COMMENTS:

REPLICATE SAMPLE QC REPORT

VI.02 68

Lab Name: GJO Analytical Laboratory

(SECTION I)

CASE: 16848

SAMPLE: 263922

Analyte	Date	Acceptance		Sample Result	Replicat Result	Units	%RPD
		Low	High				
Americium-241	12/16/99			2.99	2.01	dpm/SA	-39.20

COMMENTS:

REPLICATE SAMPLE QC REPORT

69

V1.02

Lab Name: GJO Analytical Laboratory

(SECTION I)

CASE: 16848

SAMPLE: 263931

Analyte	Date	Acceptance		Sample Result	Replicat Result	Units	%RPD
		Low	High				
Americium-241	12/11/99			0.3051	0.3948	dpm/SA	25.63
Plutonium-238	12/09/99			0.1107	0.1169	dpm/SA	5.45
Am-239+240	12/09/99			0.1521	0.2338	dpm/SA	42.34
Uranium-234	12/09/99			16.82	16.54	dpm/SA	-1.68
Uranium-235	12/09/99			1.19	0.8951	dpm/SA	-28.29
Uranium-238	12/09/99			19.29	16.30	dpm/SA	-16.80

COMMENTS:

Lab Name: GJO Analytical Laboratory

CASE: 16848

Analyte	Date	Calibration Blanks				Prep Blank	
		Result	Units	Result	Units	Result	Units
Americium-241	12/09/99					0.0280	dpm/SA
Americium-241	12/10/99					0.0410	dpm/SA
Americium-241	12/16/99					0.0332	dpm/SA
Gross Alpha	12/07/99					-0.19	PCI/SA
Gross Beta	12/07/99					0.75	PCI/SA
Plutonium-238	12/07/99					0.0007	dpm/SA
Plutonium-238	12/08/99					0.0010	dpm/SA
Plutonium-238	12/14/99					0.0025	dpm/SA
Pu-239+240	12/07/99					0.0047	dpm/SA
Pu-239+240	12/08/99					0.0029	dpm/SA
Pu-239+240	12/14/99					0.0041	dpm/SA
Uranium-234	12/01/99					0.0145	dpm/SA
Uranium-234	12/08/99					0.0348	dpm/SA
Uranium-235	12/01/99					-0.0099	dpm/SA
Uranium-235	12/08/99					-0.0025	dpm/SA
Uranium-238	12/01/99					0.0145	dpm/SA
Uranium-238	12/08/99					0.0299	dpm/SA

COMMENTS:

**RADIOCHEMICAL
SUPPORTING DOCUMENTATION**

Requisition No. 16848

The following section contains the analytical supporting documentation for the radiochemical analyses performed on this request. Commonly used laboratory codes in this section include:

PROCEDURE:

- RC-8: Gross Alpha/Beta Analysis
- RC-19: Alpha Spectrometry

QUALITY CONTROL PREFIXES

- PB: Blank
- LCS: Laboratory Control Sample
- CCV: Continuing Calibration Verification

This section contains 239 pages numbered 1 through 239.

Determination of Gross Alpha & Gross Beta

Worklist ID: 99126583

12-07-99

John K. Br

Chemist ID: G40349

Req #	Sample ID	#	Alpha Results					Beta Results						
			Activity (pCi/SA)	Uncert. +/-	MDA	Gross Counts	Net Counts	Reference Date	Activity (pCi/SA)	Uncert. +/-	MDA	Gross Counts	Net Counts	Reference Date
	PB	1	-0.19	0.49	2.09	0	-0.6	120799	-0.26	1.64	3.56	5	-1.0	120799
	LCS	2	208.85	17.98	3.83	621	617.6	120799	237.86	21.61	14.78	680	603.9	07/06/81
16848	263797	3	0.47	1.07	2.15	2	1.4	120799	2.97	2.43	3.60	18	11.8	120799
16848	263797D	4	0.14	0.84	2.13	1	0.4	120799	1.99	2.21	3.58	14	7.9	120799
16848	263798	5	-0.19	0.50	2.10	0	-0.6	120799	0.24	1.78	3.56	7	1.0	120799
16848	263799	6	0.48	1.08	2.10	2	1.4	120799	0.45	1.86	3.60	8	1.8	120799
16848	263800	7	0.82	1.25	2.10	3	2.4	120799	0.69	1.83	3.61	9	2.7	120799
16848	263801	8	-0.19	0.50	2.09	0	-0.6	120799	-0.01	1.71	3.56	6	0.0	120799
16848	263802	9	0.15	0.83	2.09	1	0.4	120799	-0.03	1.72	3.58	6	-0.1	120799
16848	263803	10	0.49	1.08	2.09	2	1.4	120799	-0.30	1.65	3.60	5	-1.2	120799
16848	263804	11	-0.20	0.51	2.13	0	-0.6	120799	2.01	2.21	3.56	14	8.0	120799
16848	263805	12	0.15	0.83	2.10	1	0.4	120799	0.73	1.92	3.58	9	2.9	120799
16848	263806	13	0.48	1.06	2.11	2	1.4	120799	1.21	2.05	3.60	11	4.8	120799
16848	263807	14	0.82	1.25	2.11	3	2.4	120799	1.19	2.05	3.61	11	4.7	120799
16848	263808	15	0.47	1.07	2.13	2	1.4	120799	2.22	2.27	3.60	15	8.8	120799
16848	263809	16	0.15	0.83	2.10	1	0.4	120799	0.47	1.85	3.58	8	1.9	120799
16848	263810	17	0.15	0.83	2.10	1	0.4	120799	0.47	1.85	3.58	8	1.9	120799
16848	263811	18	-0.19	0.50	2.09	0	-0.6	120799	-0.01	1.71	3.56	6	0.0	120799
16848	263812	19	0.15	0.83	2.10	1	0.4	120799	0.73	1.92	3.58	9	2.9	120799
16848	263813	20	-0.19	0.49	2.09	0	-0.6	120799	-0.26	1.64	3.56	5	-1.0	120799
	CCV	21	1002.23	49.88	10.09	2927	2894.7	04/01/85	2125.95	77.02	22.87	7223	6980.8	02/01/82
		22												
		23												
		24												
		25												
		26												
		27												
		28												
		29												
		30												
		31												
		32												

Sample prep. procedure: RC8 R03
 Analysis procedure: RC-8 R03
 Date of sample prep.: 12/07/99

Instrument Conditions
 Instrument: CAN2404
 High Voltage: 1525

Calibration Data	
Beta	0.2982
Alpha	0.2220
Efficiency	0.2220
RSD (%)	3.35
N:	6
**Uncertainty (%)	2.00
Background CPM	0.093
Count time of background (min)	60.0
Half-life for decay correction(Y)	432.7
Crosstalk (%)	0.44

** Uncertainty of the calibration standard activity.

Uncertainty is calculated with 1.96 sigma.

MDA is Minimal Detectable Activity.

CCV is #107 calibration

$CCV \text{ recovery} = \frac{1002}{1000} = 100.2\%$

$CCV \text{ recovery} = \frac{2126}{2010} = 105.8\%$

Supervisor Review:

OK

12/14/99

S. Spinks

12/14/99

		Alpha results in pCi			Alpha results in dpm			Beta results in pCi			Beta results in dpm		
		Activity (pCi/SA)	Uncert. +/-	MDA	Activity (dpm/SA)	Uncert. +/-	MDA	Activity (pCi/SA)	Uncert. +/-	MDA	Activity (dpm/SA)	Uncert. +/-	MDA
263797	3	0.47	1.07	2.15	1.04	2.38	4.76	2.97	2.43	3.60	6.60	5.39	7.98
263797D	4	0.14	0.84	2.13	0.31	1.86	4.72	1.99	2.21	3.58	4.41	4.91	7.94
263798	5	-0.19	0.50	2.10	-0.42	1.10	4.65	0.24	1.78	3.56	0.54	3.95	7.90
263799	6	0.48	1.06	2.10	1.08	2.36	4.66	0.45	1.86	3.60	1.01	4.13	7.98
263800	7	0.82	1.25	2.10	1.82	2.78	4.67	0.69	1.93	3.61	1.52	4.28	8.02
263801	8	-0.19	0.50	2.09	-0.42	1.10	4.64	-0.01	1.71	3.56	-0.02	3.80	7.90
263802	9	0.15	0.83	2.09	0.33	1.84	4.64	-0.03	1.72	3.58	-0.06	3.81	7.94
263803	10	0.49	1.06	2.09	1.09	2.35	4.63	-0.30	1.65	3.60	-0.67	3.67	7.98
263804	11	-0.20	0.51	2.13	-0.45	1.13	4.72	2.01	2.21	3.56	4.45	4.90	7.90
263805	12	0.15	0.83	2.10	0.32	1.84	4.67	0.73	1.92	3.58	1.61	4.26	7.94
263806	13	0.48	1.06	2.11	1.07	2.36	4.69	1.21	2.05	3.60	2.69	4.54	7.98
263807	14	0.82	1.25	2.11	1.82	2.78	4.69	1.19	2.05	3.61	2.64	4.55	8.02
263808	15	0.47	1.07	2.13	1.05	2.37	4.73	2.22	2.27	3.60	4.92	5.04	7.98
263809	16	0.15	0.83	2.10	0.33	1.84	4.66	0.47	1.85	3.58	1.05	4.12	7.94
263810	17	0.15	0.83	2.10	0.33	1.84	4.66	0.47	1.85	3.58	1.05	4.12	7.94
263811	18	-0.19	0.50	2.09	-0.42	1.10	4.64	-0.01	1.71	3.56	-0.02	3.80	7.90
263812	19	0.15	0.83	2.10	0.32	1.84	4.67	0.73	1.92	3.58	1.61	4.26	7.94
263813	20	-0.19	0.49	2.09	-0.42	1.09	4.63	-0.26	1.64	3.56	-0.58	3.64	7.90

Values in dpm were calculated by multiplying pCi values by 2.22

(SECTION II)

174

Worklist ID: 99084967

Instrument: CAN2404

Chemist: Hutchinson R. Bon 12/7/99

Sample Type: SWIPE

#	Req #	Sample ID	Carrier #	Control Acceptance Range	Comments
1		PB			
2		LCS		ALPHA: 169.2 - 245.1; BETA: 187.0 - 253.0	
3	16848	263797			
4	16848	263797D			The duplicate was created by simply counting the same
5	16848	263798			
6	16848	263799			
7	16848	263800			
8	16848	263801			
9	16848	263802			
10	16848	263803			
11	16848	263804			
12	16848	263805			
13	16848	263806			
14	16848	263807			
15	16848	263808			
16	16848	263809			
17	16848	263810			
18	16848	263811			
19	16848	263812			
20	16848	263813			
21		CCV		ALPHA: 900 - 1100; BETA: 1809 - 2211	
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
32					

Additional Comments:

Sample Prep Procedure: RC8 R03

Analysis Procedure: RC-8 R03

Date of sample prep: 12-07-1999

** LCS = 5.0 mL of LCSWR24, known values: alpha 214, beta 230.

WORKLIST 99126563

PROGRAM NAME: GRB3

SAMPLE #:3. COLLECT TIME:6.00 PB
10:51:03,12-07-1999

ALPHA RESULT: 0 +/- 0 pCi
ALPHA GROSS COUNT: 0
ALPHA NET COUNT: 0 +/- 0

BETA RESULT: 1.12 pCi
BETA GROSS COUNT: 5.
BETA NET COUNT: .83 +/- 0

SAMPLE #:4. COLLECT TIME:6.00 LCS
10:57:25,12-07-1999

ALPHA RESULT: 168.91 +/- 0 pCi
ALPHA GROSS COUNT: 621.
ALPHA NET COUNT: 103.50 +/- 0

BETA RESULT: 147.90 pCi
BETA GROSS COUNT: 660.
BETA NET COUNT: 110.00 +/- 0

SAMPLE #:5. COLLECT TIME:6.00 263797
11:03:47,12-07-1999

ALPHA RESULT: .54 +/- 0 pCi
ALPHA GROSS COUNT: 2.
ALPHA NET COUNT: .33 +/- 0

BETA RESULT: 4.03 pCi
BETA GROSS COUNT: 18.
BETA NET COUNT: 3.00 +/- 0

SAMPLE #:5. COLLECT TIME:6.00 263797D
11:14:29,12-07-1999

ALPHA RESULT: .60 +/- 1.20 pCi
ALPHA GROSS COUNT: 1.
ALPHA NET COUNT: .16 +/- .33

BETA RESULT: 6.92 pCi
BETA GROSS COUNT: 14.
BETA NET COUNT: 2.32 +/- 1.24

SAMPLE #:6. COLLECT TIME:6.00 263798.
11:20:52,12-07-1999

ALPHA RESULT: 0 +/- 0 pCi
ALPHA GROSS COUNT: 0
ALPHA NET COUNT: 0 +/- 0

BETA RESULT: 3.48 pCi
BETA GROSS COUNT: 7.
BETA NET COUNT: 1.16 +/- .88

SAMPLE #:7. COLLECT TIME:6.00 263799
11:27:14,12-07-1999

ALPHA RESULT: 1.20 +/- 1.70 pCi
ALPHA GROSS COUNT: 2.
ALPHA NET COUNT: .33 +/- .47

BETA RESULT: 3.90 pCi
BETA GROSS COUNT: 8.
BETA NET COUNT: 1.30 +/- .94

SAMPLE #:8. COLLECT TIME:6.00 263800
11:33:36,12-07-1999

ALPHA RESULT: 1.81 +/- 2.09 pCi
ALPHA GROSS COUNT: 3.
ALPHA NET COUNT: .50 +/- .57

BETA RESULT: 4.37 pCi
BETA GROSS COUNT: 9.
BETA NET COUNT: 1.46 +/- 1.00

SAMPLE #:9. COLLECT TIME:6.00 263801
11:39:58,12-07-1999

ALPHA RESULT: 0 +/- 0 pCi
ALPHA GROSS COUNT: 0
ALPHA NET COUNT: 0 +/- 0

BETA RESULT: 2.98 pCi
BETA GROSS COUNT: 6.
BETA NET COUNT: 1.00 +/- .81

SAMPLE #:10. COLLECT TIME:6.00 263802
11:46:21,12-07-1999

ALPHA RESULT: .60 +/- 1.20 pCi
ALPHA GROSS COUNT: 1.
ALPHA NET COUNT: .16 +/- .33

BETA RESULT: 2.94 pCi
BETA GROSS COUNT: 6.
BETA NET COUNT: .98 +/- .81

SAMPLE #:11. COLLECT TIME:6.00 263803
11:52:43,12-07-1999

ALPHA RESULT: 1.20 +/- 1.70 pCi
ALPHA GROSS COUNT: 2.
ALPHA NET COUNT: .33 +/- .47

BETA RESULT: 2.41 pCi
BETA GROSS COUNT: 5.
BETA NET COUNT: .80 +/- .74

SAMPLE #:12. COLLECT TIME:6.00 263804
11:59:05,12-07-1999

ALPHA RESULT: 0 +/- 0 pCi
ALPHA GROSS COUNT: 0
ALPHA NET COUNT: 0 +/- 0

BETA RESULT: 6.96 pCi
BETA GROSS COUNT: 14.
BETA NET COUNT: 2.33 +/- 1.24

SAMPLE #:13. COLLECT TIME:6.00 263805
12:05:27,12-07-1999

ALPHA RESULT: .60 +/- 1.20 pCi
ALPHA GROSS COUNT: 1.
ALPHA NET COUNT: .16 +/- .33

BETA RESULT: 4.44 pCi
BETA GROSS COUNT: 9.
BETA NET COUNT: 1.48 +/- 1.00

SAMPLE #:14. COLLECT TIME:6.00 263806
12:11:50,12-07-1999

ALPHA RESULT: 1.20 +/- 1.70 pCi
ALPHA GROSS COUNT: 2.
ALPHA NET COUNT: .33 +/- .47

BETA RESULT: 5.40 pCi
BETA GROSS COUNT: 11.
BETA NET COUNT: 1.80 +/- 1.10

SAMPLE #:15. COLLECT TIME:6.00 263807
12:18:12,12-07-1999

ALPHA RESULT: 1.81 +/- 2.09 pCi
ALPHA GROSS COUNT: 3.
ALPHA NET COUNT: .50 +/- .57

BETA RESULT: 5.36 pCi
BETA GROSS COUNT: 11.
BETA NET COUNT: 1.79 +/- 1.10

SAMPLE #:16. COLLECT TIME:6.00 263808
12:24:34,12-07-1999

ALPHA RESULT: 1.20 +/- 1.70 pCi
ALPHA GROSS COUNT: 2.
ALPHA NET COUNT: .33 +/- .47

BETA RESULT: 7.39 pCi
BETA GROSS COUNT: 15.
BETA NET COUNT: 2.47 +/- 1.29

SAMPLE #:17. COLLECT TIME:6.00 263809
12:30:56,12-07-1999

ALPHA RESULT: .60 +/- 1.20 pCi
ALPHA GROSS COUNT: 1.
ALPHA NET COUNT: .16 +/- .33

BETA RESULT: 3.94 pCi
BETA GROSS COUNT: 8.
BETA NET COUNT: 1.32 +/- .94

SAMPLE #:18. COLLECT TIME:6.00 263810
12:37:19,12-07-1999

ALPHA RESULT: .60 +/- 1.20 pCi
ALPHA GROSS COUNT: 1.
ALPHA NET COUNT: .16 +/- .33

BETA RESULT: 3.94 pCi
BETA GROSS COUNT: 8.
BETA NET COUNT: 1.32 +/- .94

SAMPLE #:19. COLLECT TIME:6.00 263811
12:43:41,12-07-1999

ALPHA RESULT: 0 +/- 0 pCi
ALPHA GROSS COUNT: 0
ALPHA NET COUNT: 0 +/- 0

BETA RESULT: 2.98 pCi
BETA GROSS COUNT: 6.
BETA NET COUNT: 1.00 +/- .81

SAMPLE #:20. COLLECT TIME:6.00 263812
12:50:03,12-07-1999

ALPHA RESULT: .60 +/- 1.20 pCi
ALPHA GROSS COUNT: 1.
ALPHA NET COUNT: .16 +/- .33

BETA RESULT: 4.44 pCi
BETA GROSS COUNT: 9.
BETA NET COUNT: 1.48 +/- 1.00

SAMPLE #:21. COLLECT TIME:6.00 263813
12:56:25,12-07-1999

ALPHA RESULT: 0 +/- 0 pCi
ALPHA GROSS COUNT: 0
ALPHA NET COUNT: 0 +/- 0

BETA RESULT: 2.48 pCi
BETA GROSS COUNT: 5.
BETA NET COUNT: .83 +/- .74

SAMPLE #:22. COLLECT TIME:6.00 *CCV*
13:02:48,12-07-1999

ALPHA RESULT: 1767.51 +/- 65.34 pCi
ALPHA GROSS COUNT: 2927.
ALPHA NET COUNT: 487.83 +/- 18.03

BETA RESULT: 3488.68 pCi
BETA GROSS COUNT: 7223.
BETA NET COUNT: 1168.70 +/- 28.35

Instrument: CAN2404

Chemist: *Jonathan R. Bue* 12/7/99

Alpha Standard		Beta Standard	
Isotope(s):	Am-241	Isotope(s):	Sr-90/Y-90
ID:	82-49-1	ID:	82-22-4
Standard Activity:	1000.0 pCi/mL	Standard Activity:	2010.0 pCi/mL
Standard Uncertainty:	2.00 %	Standard Uncertainty:	1.49 %
Reference Date:	12/15/92	Reference Date:	02/01/92
Half-life:	432.7 years	Half-life:	28.6 years

Alpha Efficiency Calibration:

#	Aliquot Size (mL)	Gross Counts	Net Counts	Alpha Standard Activity (pCi)	Efficiency
1	1.00	59966	59343.4	988.9	0.2253
2	1.00	62787	62143.2	988.9	0.2359
3	1.00	58047	57444.8	988.9	0.2181
4	1.00	57984	57380.8	988.9	0.2178
5	1.00	57904	57301.4	988.9	0.2175
6	1.00	57916	57312.0	988.9	0.2176
7					
8					
9					
10					
Average =				0.2220	
% RSD =				3.35	
N =				6	

Alpha Background CPM: 0.093
 Count time: 120 min
 Date Samples Counted: 12/06/99
 Crosstalk of Beta into Alpha: 0.44 %

Beta Efficiency Calibration:

#	Aliquot Size (mL)	Gross Counts	Net Counts	Beta Standard Activity (pCi)	Efficiency
1	1.00	139088	134128.1	1661.8	0.3030
2	1.00	143895	138707.4	1661.8	0.3133
3	1.00	134454	129648.9	1661.8	0.2929
4	1.00	134667	129867.0	1661.8	0.2934
5	1.00	134532	129738.5	1661.8	0.2931
6	1.00	134859	130064.5	1661.8	0.2938
7					
8					
9					
10					
Average =				0.2982	
% RSD =				2.80	
N =				6	

Beta Background CPM: 1.01
 Count time: 120 min
 Date Samples Counted: 12/06/99
 Crosstalk of Alpha into Beta: 8.07 %

Determination of Gross Alpha & Gross Beta

Worklist ID: 99126564

Hutchinson R. Be

12-08-99

Chemist ID: G40349

Req #	Sample ID	#	Alpha Results					Beta Results					Count Time (min.)	Start Count Date	Start Count Time		
			Activity (pCi/SA)	Uncert. +/-	MDA	Gross Counts	Net Counts	Reference Date	Activity (pCi/SA)	Uncert. +/-	MDA	Gross Counts				Net Counts	Reference Date
	PB	1	-0.19	0.50	2.10	0	-0.6	12/07/99	0.75	1.91	3.56	9	3.0	12/07/99	6.0	12/07/99	13:27
	LCS	2	192.31	17.15	3.79	572	568.7	12/07/99	230.55	21.19	14.29	638	585.8	07/06/81	6.0	12/07/99	13:33
16848	263814	3	-0.19	0.50	2.09	0	-0.6	12/07/99	-0.01	1.71	3.56	6	0.0	12/07/99	6.0	12/07/99	13:39
16848	263814D	4	0.15	0.83	2.10	1	0.4	12/07/99	0.22	1.79	3.58	7	0.9	12/07/99	6.0	12/07/99	13:50
16848	263815	5	-0.19	0.50	2.09	0	-0.6	12/07/99	-0.01	1.71	3.56	6	0.0	12/07/99	6.0	12/07/99	13:57
16848	263816	6	-0.19	0.49	2.08	0	-0.5	12/07/99	-0.51	1.56	3.56	4	-2.0	12/07/99	6.0	12/07/99	14:03
16848	263817	7	0.14	0.83	2.11	1	0.4	12/07/99	1.23	2.04	3.58	11	4.9	12/07/99	6.0	12/07/99	14:09
16848	263818	8	-0.19	0.50	2.10	0	-0.6	12/07/99	0.50	1.85	3.56	8	2.0	12/07/99	6.0	12/07/99	14:16
16848	263819	9	-0.19	0.49	2.08	0	-0.5	12/07/99	-0.51	1.56	3.56	4	-2.0	12/07/99	6.0	12/07/99	14:22
16848	263820	10	0.49	1.06	2.10	2	1.4	12/07/99	0.20	1.79	3.60	7	0.8	12/07/99	6.0	12/07/99	14:28
16848	263821	11	0.15	0.82	2.08	1	0.5	12/07/99	-0.78	1.49	3.58	3	-3.1	12/07/99	6.0	12/07/99	14:35
16848	263822	12	-0.19	0.49	2.09	0	-0.6	12/07/99	-0.26	1.64	3.56	5	-1.0	12/07/99	6.0	12/07/99	14:41
16848	263823	13	-0.19	0.50	2.11	0	-0.6	12/07/99	1.00	1.98	3.56	10	4.0	12/07/99	6.0	12/07/99	14:47
16848	263824	14	0.14	0.83	2.12	1	0.4	12/07/99	1.48	2.10	3.58	12	5.9	12/07/99	6.0	12/07/99	14:54
16848	263825	15	-0.19	0.49	2.09	0	-0.6	12/07/99	-0.26	1.64	3.56	5	-1.0	12/07/99	6.0	12/07/99	15:00
16848	263826	16	23.44	5.63	2.22	70	69.3	12/07/99	6.12	3.41	4.68	38	24.3	12/07/99	6.0	12/07/99	15:07
16848	263827	17	0.47	1.07	2.13	2	1.4	12/07/99	2.22	2.27	3.60	15	8.8	12/07/99	6.0	12/07/99	15:13
16848	263828	18	0.15	0.83	2.10	1	0.4	12/07/99	0.22	1.79	3.58	7	0.9	12/07/99	6.0	12/07/99	15:19
	CCV	19	1043.21	51.33	10.04	3045	3013.0	04/01/85	2098.70	76.31	23.30	7143	6891.2	02/01/92	6.0	12/07/99	15:28
		20															
		21															
		22															
		23															
		24															
		25															
		26															
		27															
		28															
		29															
		30															
		31															
		32															

Sample prep. procedure: RC8 R03
 Analysis procedure: RC-8 R03
 Date of sample prep.: 12/07/99

Instrument Conditions
 Instrument: CAN2404
 High Voltage: 1525

Calibration Data

	Alpha	Beta
Efficiency:	0.2220	0.2982
RSD (%):	3.35	2.80
N:	6	6
**Uncertainty (%):	2.00	1.49
Background CPM:	0.093	1.01
Count time of background (min):	60.0	60.0
Half-life for decay correction(y):	432.7	28.8
Crosstalk (%):	0.44	8.07

** Uncertainty of the calibration standard activity.

Uncertainty is calculated with 1.96 sigma.
 MDA is Minimal Detectable Activity.

Calculations by: GABAF v1

CCV is #108 calibration
 $CCV \alpha \text{ recovery} = \frac{1043}{1000} = 104.3\%$
 $CCV \beta \text{ recovery} = \frac{2099}{2010} = 104.4\%$

Supervisor Review:

Q.C. Review:

OK 040 12/29/99
entry + QC by S. Spate 12/14/99
EB 12/14/99
 110

182

		Alpha results in pCi			Alpha results in dpm			Beta results in pCi			Beta results in dpm		
		Activity (pCi/SA)	Uncert. +/-	MDA	Activity (dpm/SA)	Uncert. +/-	MDA	Activity (pCi/SA)	Uncert. +/-	MDA	Activity (dpm/SA)	Uncert. +/-	MDA
263814	3	-0.19	0.50	2.09	-0.42	1.10	4.64	-0.01	1.71	3.56	-0.02	3.80	7.90
263814D	4	0.15	0.83	2.10	0.33	1.84	4.65	0.22	1.79	3.58	0.50	3.97	7.94
263815	5	-0.19	0.50	2.09	-0.42	1.10	4.64	-0.01	1.71	3.56	-0.02	3.80	7.90
263816	6	-0.19	0.49	2.08	-0.41	1.09	4.62	-0.51	1.56	3.56	-1.14	3.47	7.90
263817	7	0.14	0.83	2.11	0.32	1.85	4.69	1.23	2.04	3.58	2.73	4.53	7.94
263818	8	-0.19	0.50	2.10	-0.43	1.11	4.66	0.50	1.85	3.56	1.10	4.10	7.90
263819	9	-0.19	0.49	2.08	-0.41	1.09	4.62	-0.51	1.56	3.56	-1.14	3.47	7.90
263820	10	0.49	1.06	2.10	1.08	2.36	4.65	0.20	1.79	3.60	0.45	3.98	7.98
263821	11	0.15	0.82	2.08	0.34	1.83	4.61	-0.78	1.49	3.58	-1.74	3.31	7.94
263822	12	-0.19	0.49	2.09	-0.42	1.09	4.63	-0.26	1.64	3.56	-0.58	3.64	7.90
263823	13	-0.19	0.50	2.11	-0.43	1.12	4.68	1.00	1.98	3.56	2.22	4.39	7.90
263824	14	0.14	0.83	2.12	0.31	1.85	4.70	1.48	2.10	3.58	3.29	4.66	7.94
263825	15	-0.19	0.49	2.09	-0.42	1.09	4.63	-0.26	1.64	3.56	-0.58	3.64	7.90
263826	16	23.44	5.63	2.22	52.03	12.49	4.93	6.12	3.41	4.68	13.59	7.57	10.40
263827	17	0.47	1.07	2.13	1.05	2.37	4.73	2.22	2.27	3.60	4.92	5.04	7.98
263828	18	0.15	0.83	2.10	0.33	1.84	4.65	0.22	1.79	3.58	0.50	3.97	7.94

Values in dpm were calculated by multiplying pCi values by 2.22

SECTION II

Worklist ID: 99126584

Instrument: CAN2404

Chemist: *Justin R. B.* 12/7/99

Sample Type: SWIPE

#	Req #	Sample ID	Carrier #	Control Acceptance Range	Comments
1		PB			
2		LCS **		ALPHA: 169.2 - 245.1; BETA: 187.0 - 253.0	
3	16848	263814			
4	16848	263814D			The duplicate was created by simply counting the same sample twice.
5	16848	263815			
6	16848	263816			
7	16848	263817			
8	16848	263818			
9	16848	263819			
10	16848	263820			
11	16848	263821			
12	16848	263822			
13	16848	263823			
14	16848	263824			
15	16848	263825			
16	16848	263826			
17	16848	263827			
18	16848	263828			
19		CCV		ALPHA: 900 - 1100; BETA: 1809 - 2211	
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
32					

Additional Comments:

Sample Prep Procedure: RC8 R03

Analysis Procedure: RC-8 R03

Date of sample prep: 12-07-1999

**** LCS = 5.0 mL of LCSWR24, known values: alpha 214, beta 230.**

WORKLIST 99126564

PROGRAM NAME: GRB4

SAMPLE #:3. COLLECT TIME:6.00 PB
13:33:15,12-07-1999

ALPHA RESULT: 0 +/- 0 pCi
ALPHA GROSS COUNT: 0
ALPHA NET COUNT: 0 +/- 0

BETA RESULT: 2.01 pCi
BETA GROSS COUNT: 9.
BETA NET COUNT: 1.50 +/- 0

SAMPLE #:4. COLLECT TIME:6.00 LCS
13:39:37,12-07-1999

ALPHA RESULT: 155.59 +/- 0 pCi
ALPHA GROSS COUNT: 572.
ALPHA NET COUNT: 95.33 +/- 0

BETA RESULT: 142.97 pCi
BETA GROSS COUNT: 638.
BETA NET COUNT: 106.33 +/- 0

SAMPLE #:5. COLLECT TIME:6.00 263814
13:45:59,12-07-1999

ALPHA RESULT: 0 +/- 0 pCi
ALPHA GROSS COUNT: 0
ALPHA NET COUNT: 0 +/- 0

BETA RESULT: 1.34 pCi
BETA GROSS COUNT: 6.
BETA NET COUNT: 1.00 +/- 0

SAMPLE #:5. COLLECT TIME:6.00 263814 D
13:56:41,12-07-1999

ALPHA RESULT: .60 +/- 1.20 pCi
ALPHA GROSS COUNT: 1.
ALPHA NET COUNT: .16 +/- .33

BETA RESULT: 3.44 pCi
BETA GROSS COUNT: 7.
BETA NET COUNT: 1.15 +/- .88

SAMPLE #:6. COLLECT TIME:6.00 263815
14:03:03,12-07-1999

ALPHA RESULT: 0 +/- 0 pCi
ALPHA GROSS COUNT: 0
ALPHA NET COUNT: 0 +/- 0

BETA RESULT: 2.98 pCi
BETA GROSS COUNT: 6.
BETA NET COUNT: 1.00 +/- .81

SAMPLE #:7. COLLECT TIME:6.00 263814
14:09:24,12-07-1999

ALPHA RESULT: 0 +/- 0 pCi
ALPHA GROSS COUNT: 0
ALPHA NET COUNT: 0 +/- 0

BETA RESULT: 1.99 pCi
BETA GROSS COUNT: 4.
BETA NET COUNT: .66 +/- .66

SAMPLE #:8. COLLECT TIME:6.00 263817
14:15:45,12-07-1999

ALPHA RESULT: .60 +/- 1.20 pCi
ALPHA GROSS COUNT: 1.
ALPHA NET COUNT: .16 +/- .33

BETA RESULT: 5.43 pCi
BETA GROSS COUNT: 11.
BETA NET COUNT: 1.82 +/- 1.10

SAMPLE #:9. COLLECT TIME:6.00 263818
14:22:08,12-07-1999

ALPHA RESULT: 0 +/- 0 pCi
ALPHA GROSS COUNT: 0
ALPHA NET COUNT: 0 +/- 0

BETA RESULT: 3.98 pCi
BETA GROSS COUNT: 8.
BETA NET COUNT: 1.33 +/- .94

SAMPLE #:10. COLLECT TIME:6.00 263819
14:28:30,12-07-1999

ALPHA RESULT: 0 +/- 0 pCi
ALPHA GROSS COUNT: 0
ALPHA NET COUNT: 0 +/- 0

BETA RESULT: 1.99 pCi
BETA GROSS COUNT: 4.
BETA NET COUNT: .66 +/- .66

SAMPLE #:11. COLLECT TIME:6.00 263820
14:34:52,12-07-1999

ALPHA RESULT: 1.20 +/- 1.70 pCi
ALPHA GROSS COUNT: 2.
ALPHA NET COUNT: .33 +/- .47

BETA RESULT: 3.41 pCi
BETA GROSS COUNT: 7.
BETA NET COUNT: 1.14 +/- .88

SAMPLE #:12. COLLECT TIME:6.00 263821
14:41:14,12-07-1999

ALPHA RESULT: .60 +/- 1.20 pCi
ALPHA GROSS COUNT: 1.
ALPHA NET COUNT: .16 +/- .33

BETA RESULT: 1.45 pCi
BETA GROSS COUNT: 3.
BETA NET COUNT: .48 +/- .57

SAMPLE #:13. COLLECT TIME:6.00 263822
14:47:37,12-07-1999

ALPHA RESULT: 0 +/- 0 pCi
ALPHA GROSS COUNT: 0
ALPHA NET COUNT: 0 +/- 0

BETA RESULT: 2.48 pCi
BETA GROSS COUNT: 5.
BETA NET COUNT: .83 +/- .74

SAMPLE #:14. COLLECT TIME:6.00 263823
14:53:59,12-07-1999

ALPHA RESULT: 0 +/- 0 pCi
ALPHA GROSS COUNT: 0
ALPHA NET COUNT: 0 +/- 0

BETA RESULT: 4.97 pCi
BETA GROSS COUNT: 10.
BETA NET COUNT: 1.66 +/- 1.05

SAMPLE #:15. COLLECT TIME:6.00 263824
15:00:21,12-07-1999

ALPHA RESULT: .60 +/- 1.20 pCi
ALPHA GROSS COUNT: 1.
ALPHA NET COUNT: .16 +/- .33

BETA RESULT: 5.93 pCi
BETA GROSS COUNT: 12.
BETA NET COUNT: 1.98 +/- 1.15

SAMPLE #:16. COLLECT TIME:6.00 263825
15:06:43,12-07-1999

ALPHA RESULT: 0 +/- 0 pCi
ALPHA GROSS COUNT: 0
ALPHA NET COUNT: 0 +/- 0

BETA RESULT: 2.48 pCi
BETA GROSS COUNT: 5.
BETA NET COUNT: .83 +/- .74

SAMPLE #:17. COLLECT TIME:6.00 *263826*
15:13:05,12-07-1999

ALPHA RESULT: 42.27 +/- 10.10 pCi
ALPHA GROSS COUNT: 70.
ALPHA NET COUNT: 11.66 +/- 2.78

BETA RESULT: 15.40 pCi
BETA GROSS COUNT: 36.
BETA NET COUNT: 5.16 +/- 2.01

SAMPLE #:18. COLLECT TIME:6.00 *263827*
15:19:27,12-07-1999

ALPHA RESULT: 1.20 +/- 1.70 pCi
ALPHA GROSS COUNT: 2.
ALPHA NET COUNT: .33 +/- .47

BETA RESULT: 7.39 pCi
BETA GROSS COUNT: 15.
BETA NET COUNT: 2.47 +/- 1.29

SAMPLE #:19. COLLECT TIME:6.00 *263828*
15:25:50,12-07-1999

ALPHA RESULT: .60 +/- 1.20 pCi
ALPHA GROSS COUNT: 1.
ALPHA NET COUNT: .16 +/- .33

BETA RESULT: 3.44 pCi
BETA GROSS COUNT: 7.
BETA NET COUNT: 1.15 +/- .88

SAMPLE #:20. COLLECT TIME:6.00 *CCV*
15:32:13,12-07-1999

ALPHA RESULT: 1838.76 +/- 66.64 pCi
ALPHA GROSS COUNT: 3045.
ALPHA NET COUNT: 507.50 +/- 18.39

BETA RESULT: 3444.65 pCi
BETA GROSS COUNT: 7143.
BETA NET COUNT: 1153.96 +/- 28.20

Instrument: CAN2404

Chemist: *Richard R. Burr* 12/7/99

Alpha Standard		Beta Standard	
Isotope(s):	Am-241	Isotope(s):	Sr-90/Y-90
ID:	82-49-1	ID:	82-22-4
Standard Activity:	1000.0 pCi/mL	Standard Activity:	2010.0 pCi/mL
Standard Uncertainty:	2.00 %	Standard Uncertainty:	1.49 %
Reference Date:	12/15/92	Reference Date:	02/01/92
Half-life:	432.7 years	Half-life:	28.6 years

Alpha Efficiency Calibration:

#	Aliquot Size (mL)	Gross Counts	Net Counts	Alpha Standard Activity (pCi)	Efficiency
1	1.00	59966	59343.4	988.9	0.2253
2	1.00	62787	62143.2	988.9	0.2359
3	1.00	58047	57444.8	988.9	0.2181
4	1.00	57984	57380.8	988.9	0.2178
5	1.00	57904	57301.4	988.9	0.2175
6	1.00	57916	57312.0	988.9	0.2176
7					
8					
9					
10					
Average =				0.2220	
% RSD =				3.35	
N =				6	

Alpha Background CPM: 0.093
 Count time: 120 min
 Date Samples Counted: 12/06/99
 Crosstalk of Beta into Alpha: 0.44 %

Beta Efficiency Calibration:

#	Aliquot Size (mL)	Gross Counts	Net Counts	Beta Standard Activity (pCi)	Efficiency
1	1.00	139088	134128.1	1661.8	0.3030
2	1.00	143895	138707.4	1661.8	0.3133
3	1.00	134454	129648.9	1661.8	0.2929
4	1.00	134667	129867.0	1661.8	0.2934
5	1.00	134532	129738.5	1661.8	0.2931
6	1.00	134859	130064.5	1661.8	0.2938
7					
8					
9					
10					
Average =				0.2982	
% RSD =				2.80	
N =				6	

Beta Background CPM: 1.01
 Count time: 120 min
 Date Samples Counted: 12/06/99
 Crosstalk of Alpha into Beta: 8.07 %

Sample Preparation and Analysis Log

(SECTION II)

Sample Type: Various Solids

	Method	Isotopes	Worklist Names	Chemist	Date
Digestion & Purification	RC-19 R06	Am-241	99126522		12/17/99
		Pu-239/240, Pu-238	99126523		
		U-238, U235, U234	99126524		
Counting	RC-19 R06	Am ²⁴¹	99126522		12/13/99

Tracers (Internal Standards)

Isotope	ID	Conc (pCi/mL) @ RD	Aliquot (mL)	HL (years)	Activity (dpm)	Activity (pCi)
U-232	178-06-3	50.91	12/15/92	0.100	72	10.57
Am-243	82-76-2	50.80	12/15/92	0.100	7380	11.27
Pu-242	82-76-1	41.60	12/18/89	0.100	3.758E+05	9.24

Req	Sample ID	#	Aliquot Size	Comments/ Analysis	Sample Aliquot	Detector Number	Tare Weight (g)	Sample & Container (g)	Total Sample Size (g)
	PB	1	1 SA			35			
16848	263829	2	0.500 G			36			
16848	263830	3	0.500 G			37			
16848	263831	4	0.500 G			38			
16848	263832	5	0.500 G			39			
16848	263921	6	0.500 G		0.0393	40 35	14.704	27.413	12.709
16848	263922	7	0.500 G	*	0.0460	44 34	14.561	25.425	10.864
16848	263923	8	0.500 G	*	0.0420	42 35	14.565	26.476	11.911
16848	263924	9	0.500 G	*	0.0320	43 36	14.692	30.302	15.610
16848	263925	10	0.500 G		0.0305	44	14.552	30.939	16.387
16848	263926	11	0.500 G		0.0494	45	14.543	24.660	10.117
16848	263927	12	0.500 G		0.0550	46	14.559	23.646	9.087
16848	263928	13	0.500 G		0.0353	47	14.696	28.843	14.147
16848	263929	14	0.500 G		0.0285	48	14.467	32.032	17.565
16848	263930	15	0.500 G		0.0488	37	14.458	24.708	10.250
16848	263921D	16	0.500 G		0.0393	38	14.704	27.413	12.709
	LCSWR1, LCSWR33	17	0.250 mL			39			
		18							
		19							
		20							
		21							
		22							
		23							
		24							
		25							
		26							
		27							
		28							
		29							
		30							

Comments and Actual conditions:

- Start date: 12/1/99
- Automatic pipets calibrated in accord with QC-6 on balance # 18
- Balance # 8 used for weights of samples and their aliquots
- Sample aliquot is the fraction of the total sample taken for analysis
- * - Chemical Recovery < 30% sample to be reanalyzed

Qidby
S. Sigmund
12/15/99

0104
12/15/99

Spectral File: ND_AMS_ARCHIVE_R:R_99126522\$PB_AM.CNF

BATCH ID:	99126522	*	SAMPLE ID:	PB
SAMPLE DATE:	29-NOV-1999 00:00	*	ALIQUOT:	1.000E+00 SA
SAMPLE TITLE:		*	DETECTOR NUMBER:	035
ACQ DATE:	9-DEC-1999 09:49	*	AVERAGE EFFICIENCY:	26.3%
ELAPSED LIVE TIME:	80005.	*	RECOVERY:	67.19%
TRACER ID:	AM243_82-76-2	*	TRACER FWHM (kev):	36.16
LAMBDA VALUE:	100.	*	ROI TYPE:	MANUAL
CORRECTED TRACER DPM:	11.270	*	CONFIDENCE LEVEL:	4.65
SAMPLE MATRIX:	MISC	*	LLD CONSTANT:	2.71
ENERGY CAL DATE:	3-DEC-1999 06:53	*	EFF CAL DATE:	3-DEC-1999 06:53
BKG FILENAME:	B_035_3DEC99	*		

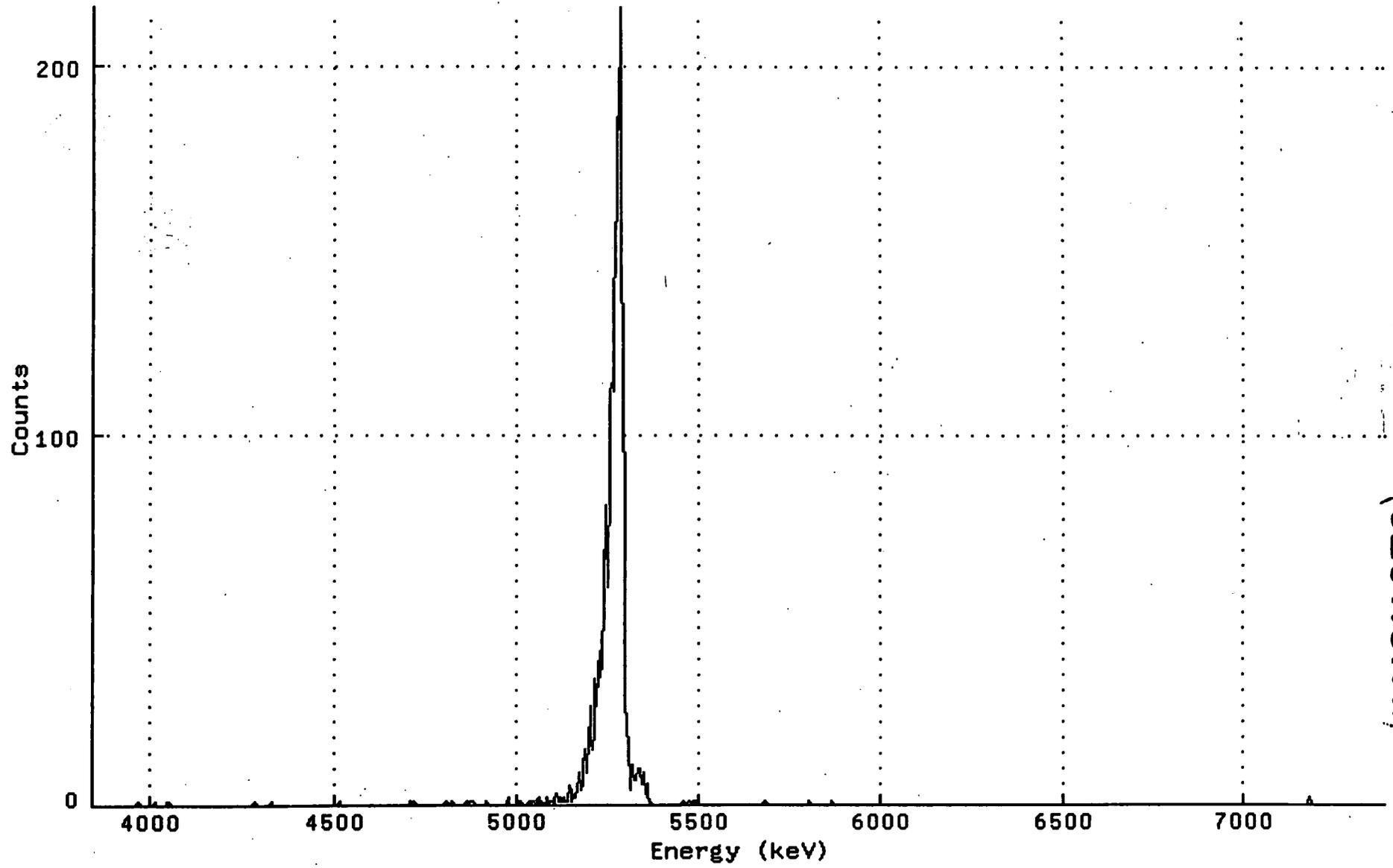
NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/SA	TPU/ERROR 2-SIGMA	MDC dpm/SA	CRIT LEVEL dpm/SA
AM-241	5479.1	6.60	0.40	99.9	2.801E-02	2.276E-02	2.398E-02	1.774E-02
AM243	5270.0	2647.00	2.00	99.6	1.127E+01	5.233E-01	3.954E-02	2.554E-02

** POSITIVE **

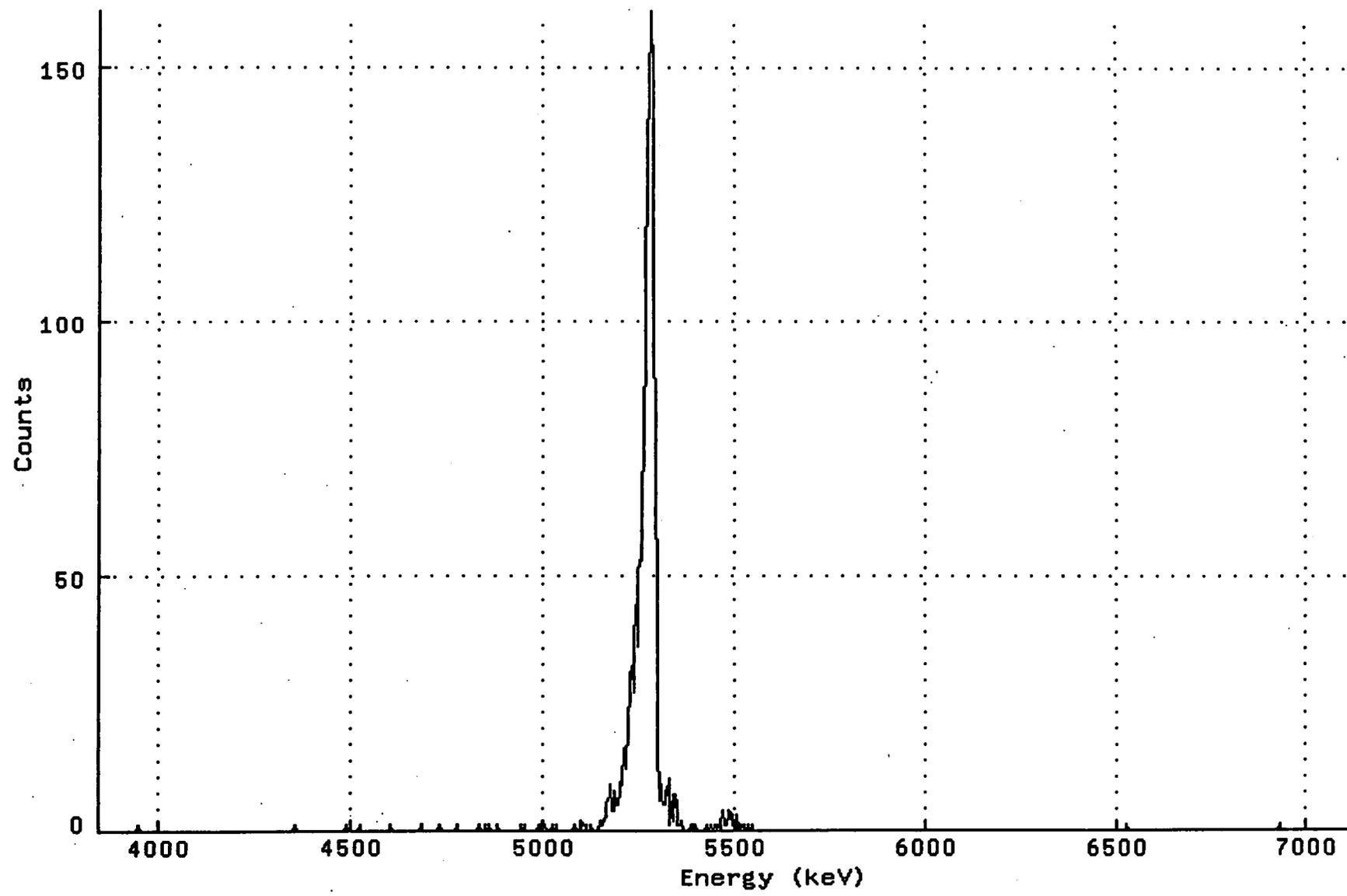
A
028 .024 u
023

Spectrum : WIZARD\$DKC200: [AHIGH.ALUSR.ARCHIVE.R]R_99126522\$PB_AM.CNF;1
Title : 035
Sample Title:
Start Time: 9-DEC-1999 09:49: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.83117E+03
Real Time : 0 22:13:25.00 Sample ID : PB Energy Slope : 3.47159E+00
Live Time : 0 22:13:25.00 Sample Type: AM Energy Quad : 0.00000E+00



(SECTION II)

Spectrum : WIZARD\$DKC200: [AHIGH.ALUSR.ARCHIVE.S]S_99126522\$263829_AM.CNF; 1
Title : 036
Sample Title:
Start Time: 9-DEC-1999 09:49: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.83429E+03
Real Time : 0 22:13:26.00 Sample ID : 263829 Energy Slope : 3.44342E+00
Live Time : 0 22:13:26.00 Sample Type: AM Energy Quad : 0.00000E+00



(SECTION II)

194

Spectral File: ND_AMS_ARCHIVE_S:S_99126522\$263830_AM.CNF

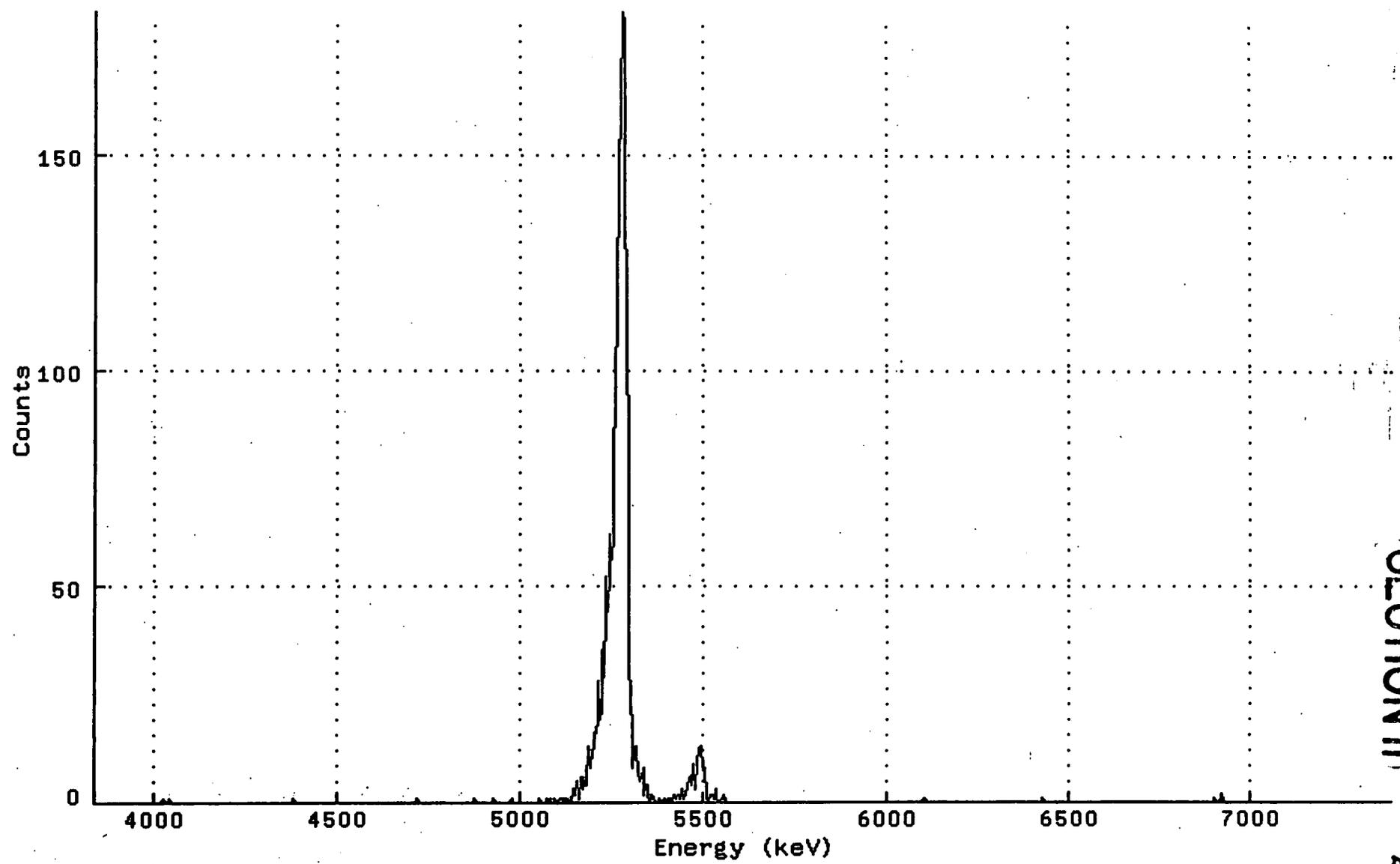
```
*****  
BATCH ID: 99126522 * SAMPLE ID: 263830  
SAMPLE DATE: 29-NOV-1999 00:00 * ALIQUOT: 5.000E-01 g  
SAMPLE TITLE: * DETECTOR NUMBER: 037  
ACQ DATE: 9-DEC-1999 09:50 * AVERAGE EFFICIENCY: 23.1%  
ELAPSED LIVE TIME: 80000. * RECOVERY: 68.28%  
TRACER ID: AM243_82-76-2 * TRACER FWHM (kev): 34.31  
LAMBDA VALUE: 100. * ROI TYPE: STANDARD  
CORRECTED TRACER DPM: 11.270 * CONFIDENCE LEVEL: 4.65  
SAMPLE MATRIX: MISC * LLD CONSTANT: 2.71  
ENERGY CAL DATE: 3-DEC-1999 06:56 * EFF CAL DATE: 3-DEC-1999 06:56  
BKG FILENAME: B_037_3DEC99 *  
*****
```

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY pCi/ g	TPU/ERROR 2-SIGMA	MDC pCi/	CRIT LEVEL g pCi/ g
AM-241	5479.1	154.00	0.00	99.9	6.603E-01	1.124E-01	1.162E-02	1.162E-02
AM243	5270.0	2360.60	0.40	99.6	1.015E+01	4.917E-01	2.431E-02	1.798E-02

*** POSITIVE ***

Spectrum : WIZARD\$DKC200: [AHIGH.ALUSR.ARCHIVE.S]S_99126522\$263830_AM.CNF; 1
Title : 037
Sample Title:
Start Time: 9-DEC-1999 09:50: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.82918E+03
Real Time : 0 22:13:20.00 Sample ID : 263830 Energy Slope : 3.47146E+00
Live Time : 0 22:13:20.00 Sample Type: AM Energy Quad : 0.00000E+00



SECTION II

24

196

Spectral File: ND_AMS_ARCHIVE_S:S_99126522\$263831_AM.CNF

```

*
BATCH ID:                99126522      *      SAMPLE ID:                263831
SAMPLE DATE:             29-NOV-1999 00:00 *      ALIQUOT:                  5.000E-01      g
SAMPLE TITLE:           *      DETECTOR NUMBER:         038
ACQ DATE:               9-DEC-1999 09:50 *      AVERAGE EFFICIENCY:     23.3%
ELAPSED LIVE TIME:     80002.          *      RECOVERY:                66.86%
TRACER ID:              AM243_82-76-2  *      TRACER FWHM (kev):      33.53
LAMBDA VALUE:          100.            *      ROI TYPE:                STANDARD
CORRECTED TRACER DPM:  11.270         *      CONFIDENCE LEVEL:       4.65
SAMPLE MATRIX:         MISC           *      LLD CONSTANT:           2.71
ENERGY CAL DATE:      3-DEC-1999 06:57 *      EFF CAL DATE:           3-DEC-1999 06:57
BKG FILENAME:         B_038_3DEC99    *
*

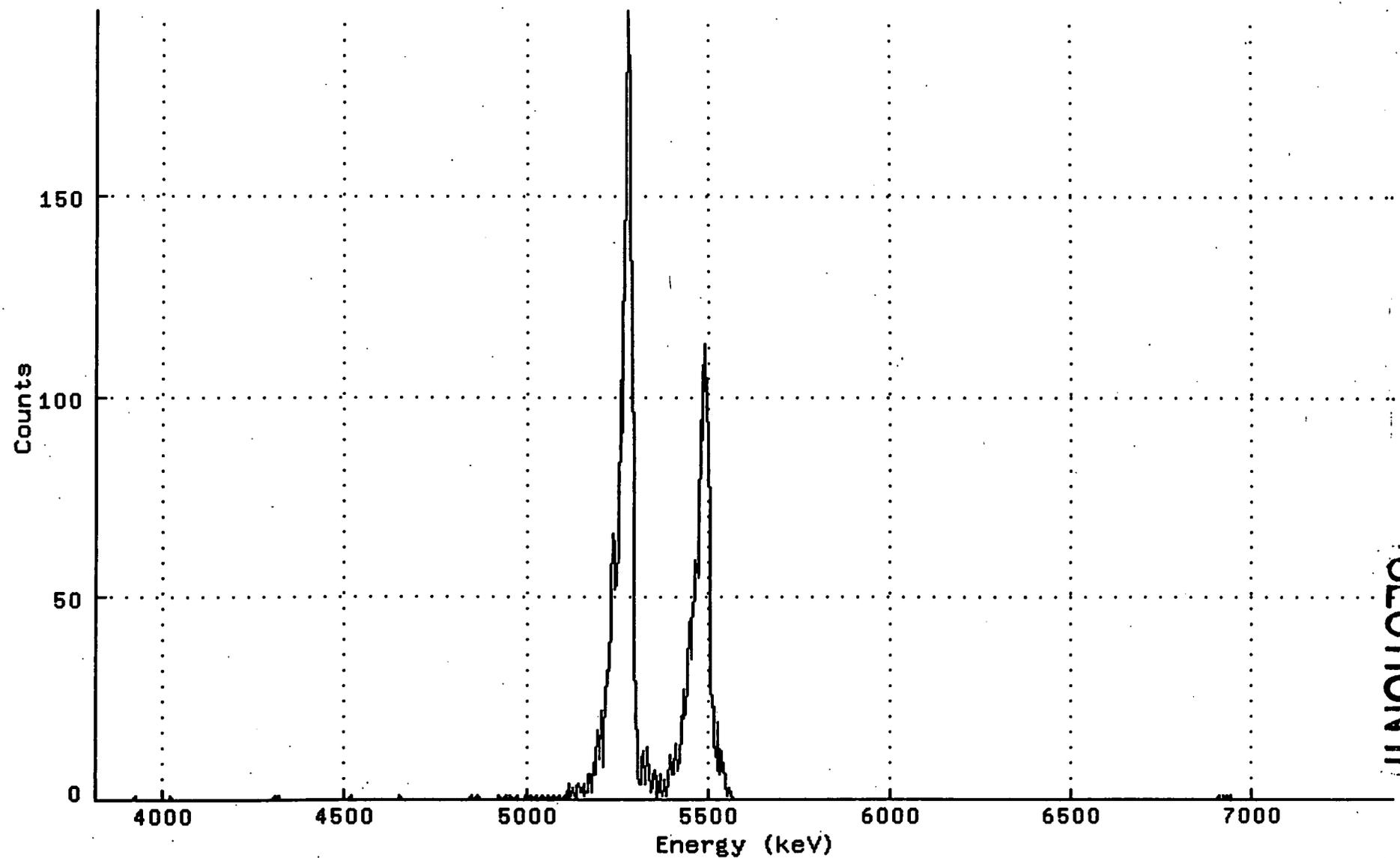
```

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY pCi/g	TPU/ERROR 2-SIGMA	MDC pCi/g	CRIT LEVEL pCi/g
AM-241	5479.1	1628.60	0.40	99.9	7.083E+00	5.245E-01	2.458E-02	1.818E-02
AM243	5270.0	2327.20	0.80	99.6	1.015E+01	4.946E-01	2.997E-02	2.090E-02

** POSITIVE **

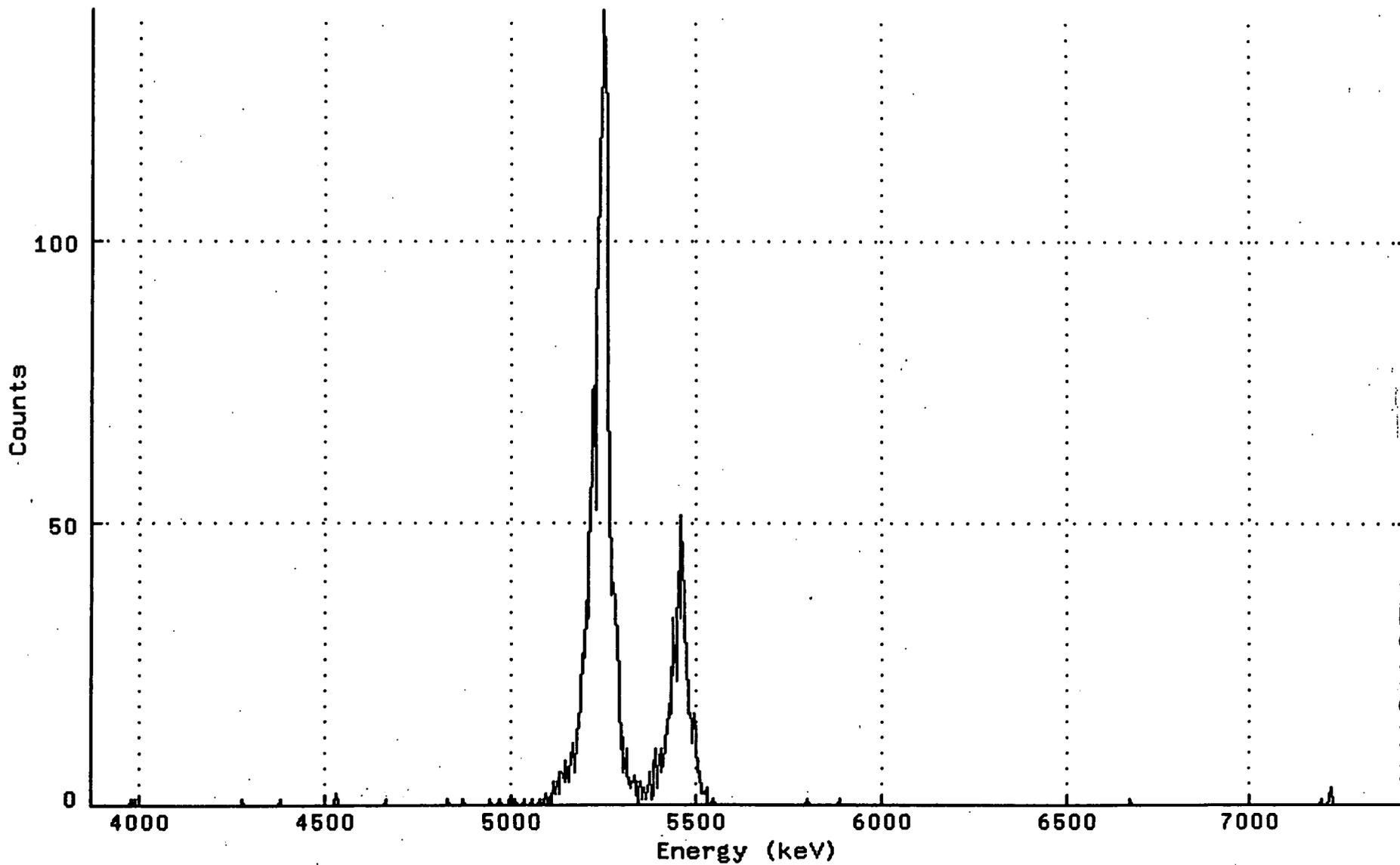
Spectrum : WIZARD\$DKC200: [AHIGH.ALUSR.ARCHIVE.S]S_99126522\$263831_AM.CNF; 1
Title : 038
Sample Title:
Start Time: 9-DEC-1999 09:50: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.80868E+03
Real Time : 0 22:13:22.00 Sample ID : 263831 Energy Slope : 3.49666E+00
Live Time : 0 22:13:22.00 Sample Type: AM Energy Quad : 0.00000E+00



SECTION III

198

Spectrum : WIZARD\$DKC200: [AHIGH.ALUSR.ARCHIVE.S]S_99126522\$263832_AM.CNF; 1
Title : 039
Sample Title:
Start Time: 9-DEC-1999 09:50: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.86215E+03
Real Time : 0 22:13:24.00 Sample ID : 263832 Energy Slope : 3.45693E+00
Live Time : 0 22:13:24.00 Sample Type: AM Energy Quad : 0.00000E+00



SECTION II

200

28

Spectral File: ND_AMS_ARCHIVE_S:S_99126522\$263921_AM.CNF

```

*
BATCH ID:          99126522      *      SAMPLE ID:          263921
SAMPLE DATE:       29-NOV-1999 00:00 *      ALIQUOT:           3.930E-02      SA
SAMPLE TITLE:      *      DETECTOR NUMBER:      033
ACQ DATE:          10-DEC-1999 09:01 *      AVERAGE EFFICIENCY: 26.7%
ELAPSED LIVE TIME: 80003.        *      RECOVERY:           45.23%
TRACER ID:         AM243_82-76-2 *      TRACER FWHM (kev):  39.22
LAMBDA VALUE:      100.          *      ROI TYPE:           MANUAL
CORRECTED TRACER DPM: 11.270     *      CONFIDENCE LEVEL:   4.65
SAMPLE MATRIX:     MISC          *      LLD CONSTANT:       2.71
ENERGY CAL DATE:   3-DEC-1999 06:50 *      EFF CAL DATE:       3-DEC-1999 06:50
BKG FILENAME:      B_033_3DEC99  *
*

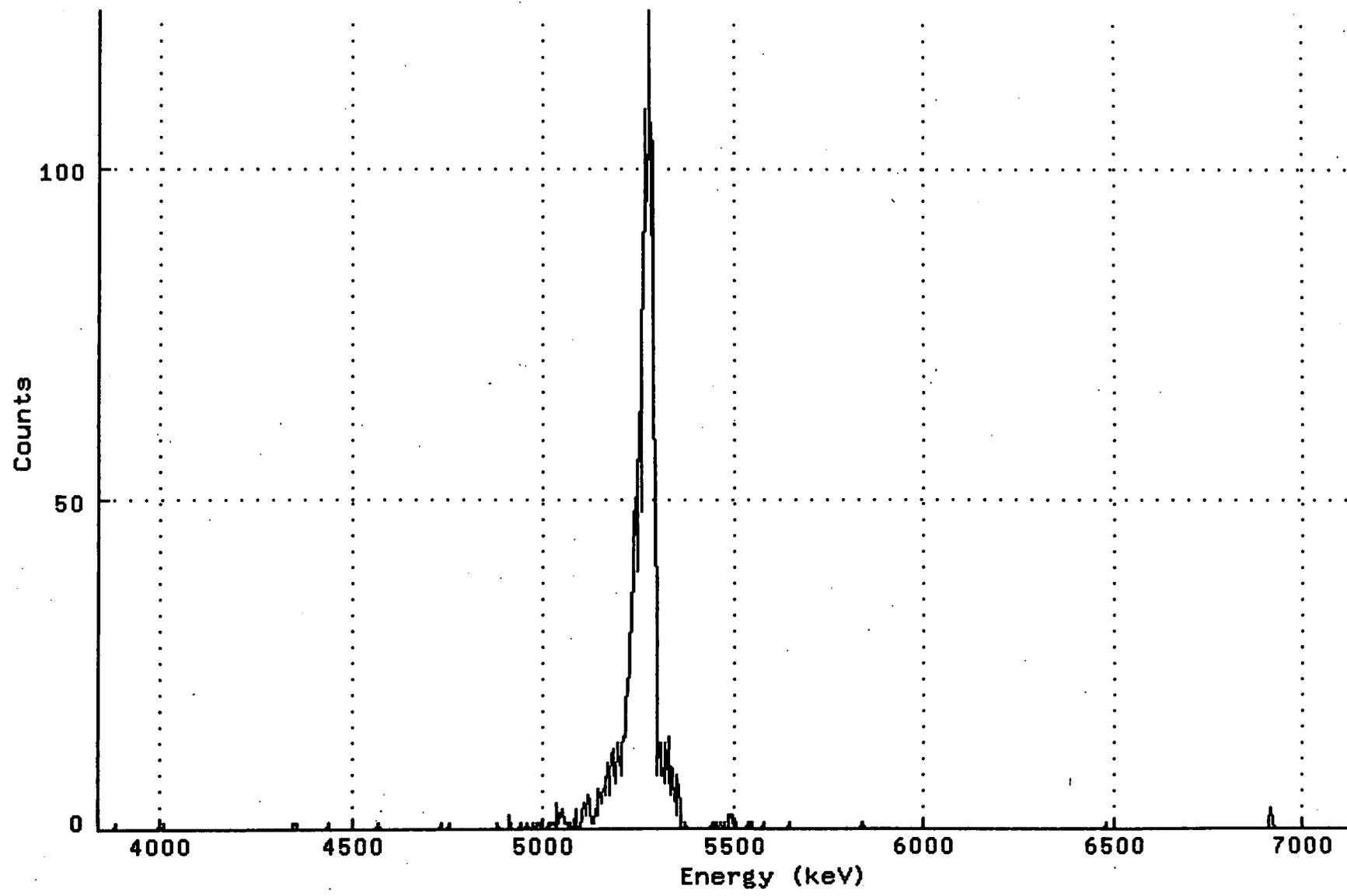
```

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/SA	TPU/ERROR 2-SIGMA	MDC dpm/SA	CRIT LEVEL dpm/SA
AM-241	5479.1	14.80	1.20	99.9	2.341E+00	1.292E+00	1.235E+00	8.316E-01
AM243	5270.0	1807.00	4.00	99.6	2.868E+02	1.533E+01	1.906E+00	1.168E+00

** POSITIVE **
** RECOUNT SAMPLE CL > 0.067 **

Spectrum : WIZARD\$DKC200: [AHIGH.ALUSR.ARCHIVE.S]S_99126522\$263921_AM.CNF; 4
Title : 033
Sample Title:
Start Time: 10-DEC-1999 09:01 Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.82871E+03
Real Time : 0 22:13:23.00 Sample ID : 263921 Energy Slope : 3.45977E+00
Live Time : 0 22:13:23.00 Sample Type: AM Energy Quad : 0.00000E+00



(SECTION III)

202

Spectral File: ND_AMS_ARCHIVE_S:S_99126522\$263925_AM.CNF

```

*
BATCH ID:          99126522      *      SAMPLE ID:          263925
SAMPLE DATE:       29-NOV-1999 00:00 *      ALIQUOT:           3.050E-02      SA
SAMPLE TITLE:      *      DETECTOR NUMBER:      044
ACQ DATE:          9-DEC-1999 09:52 *      AVERAGE EFFICIENCY: 22.8%
ELAPSED LIVE TIME: 80004.        *      RECOVERY:           65.23%
TRACER ID:         AM243_82-76-2 *      TRACER FWHM (kev):  36.99
LAMBDA VALUE:      100.          *      ROI TYPE:           MANUAL
CORRECTED TRACER DPM: 11.270     *      CONFIDENCE LEVEL:   4.65
SAMPLE MATRIX:     MISC          *      LLD CONSTANT:       2.71
ENERGY CAL DATE:   3-DEC-1999 07:11 *      EFF CAL DATE:       3-DEC-1999 07:11
BKG FILENAME:     B_044_3DEC99  *
*

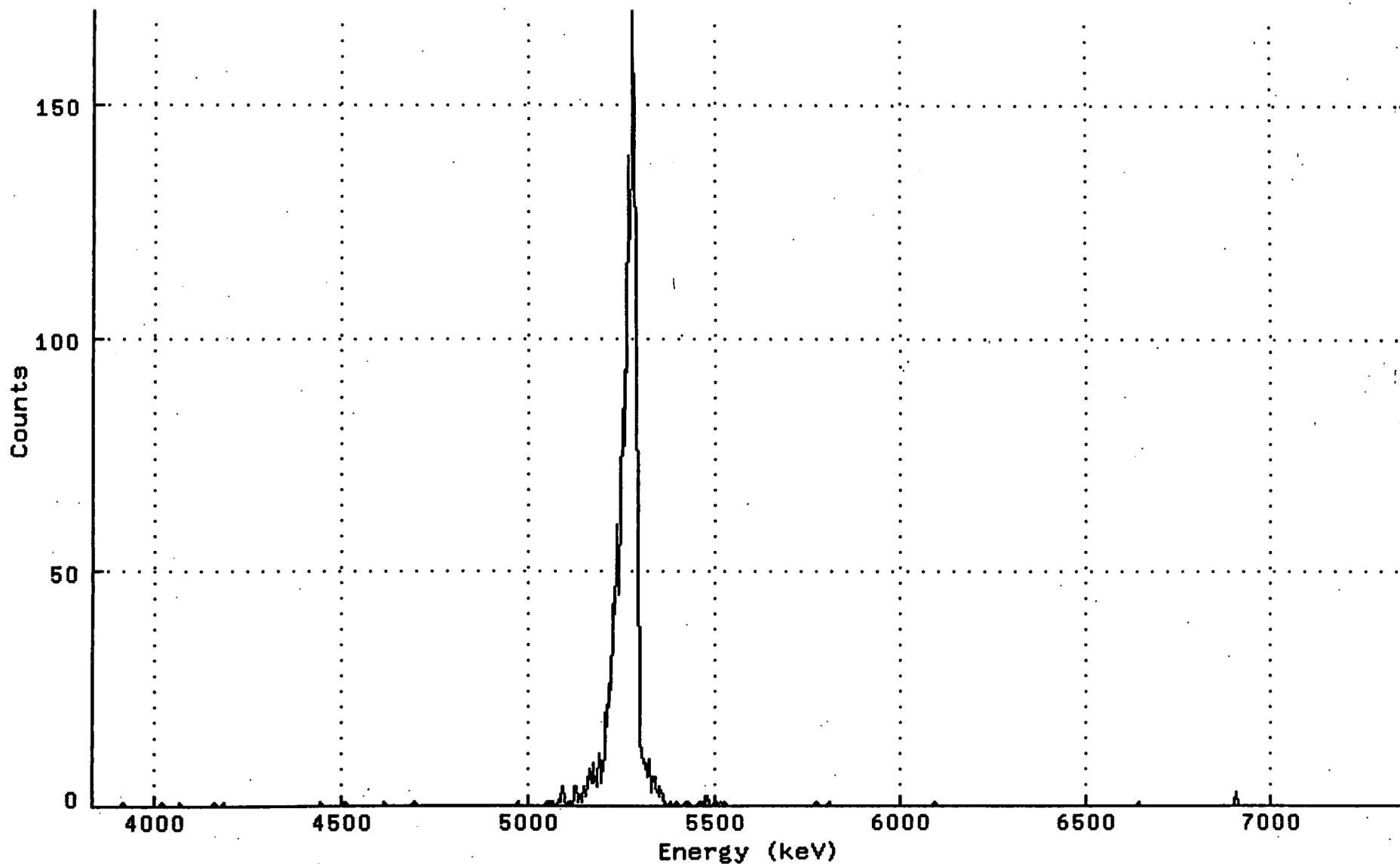
```

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/SA	TPU/ERROR 2-SIGMA	MDC dpm/SA	CRIT LEVEL dpm/SA
AM-241	5479.1	11.60	0.40	99.9	1.920E+00	1.159E+00	9.351E-01	6.918E-01
AM243	5270.0	2225.80	3.20	99.6	3.695E+02	1.833E+01	1.831E+00	1.140E+00

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.067 ***

Spectrum : WIZARD\$DKC200: [AHIGH. ALUSR. ARCHIVE. S]S_99126522\$263925_AM.CNF; 1
Title : 044
Sample Title:
Start Time: 9-DEC-1999 09:52: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.82640E+03
Real Time : 0 22:13:24.00 Sample ID : 263925 Energy Slope : 3.44100E+00
Live Time : 0 22:13:24.00 Sample Type: AM Energy Quad : 0.00000E+00



(SECTION II)

32

204

Spectral File: ND_AMS_ARCHIVE_S:S_99126522\$263926_AM.CNF

```

*
BATCH ID:          99126522      *      SAMPLE ID:          263926
SAMPLE DATE:       29-NOV-1999 00:00 *      ALIQUOT:           4.940E-02      SA
SAMPLE TITLE:      *      DETECTOR NUMBER:      045
ACQ DATE:          9-DEC-1999 09:52 *      AVERAGE EFFICIENCY: 23.5%
ELAPSED LIVE TIME: 80003.        *      RECOVERY:           69.40%
TRACER ID:         AM243_82-76-2 *      TRACER FWHM (kev):  34.45
LAMBDA VALUE:      100.          *      ROI TYPE:           MANUAL
CORRECTED TRACER DPM: 11.270     *      CONFIDENCE LEVEL:   4.65
SAMPLE MATRIX:     MISC          *      LLD CONSTANT:       2.71
ENERGY CAL DATE:   3-DEC-1999 07:13 *      EFF CAL DATE:       3-DEC-1999 07:13
BKG FILENAME:     B_045_3DEC99  *
*

```

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/ SA	TPU/ERROR 2-SIGMA	MDC dpm/	CRIT LEVEL SA dpm/
AM-241	5479.1	5.60	2.40	99.9	5.213E-01	5.580E-01	9.228E-01	5.875E-01
AM243	5270.0	2443.20	0.80	99.6	2.281E+02	1.091E+01	6.414E-01	4.472E-01

** RECOUNT SAMPLE CL > 0.067 ***

Spectrum : WIZARD\$DKC200: [AHIGH.ALUSR.ARCHIVE.S]S_99126522\$263926_AM.CNF; 1

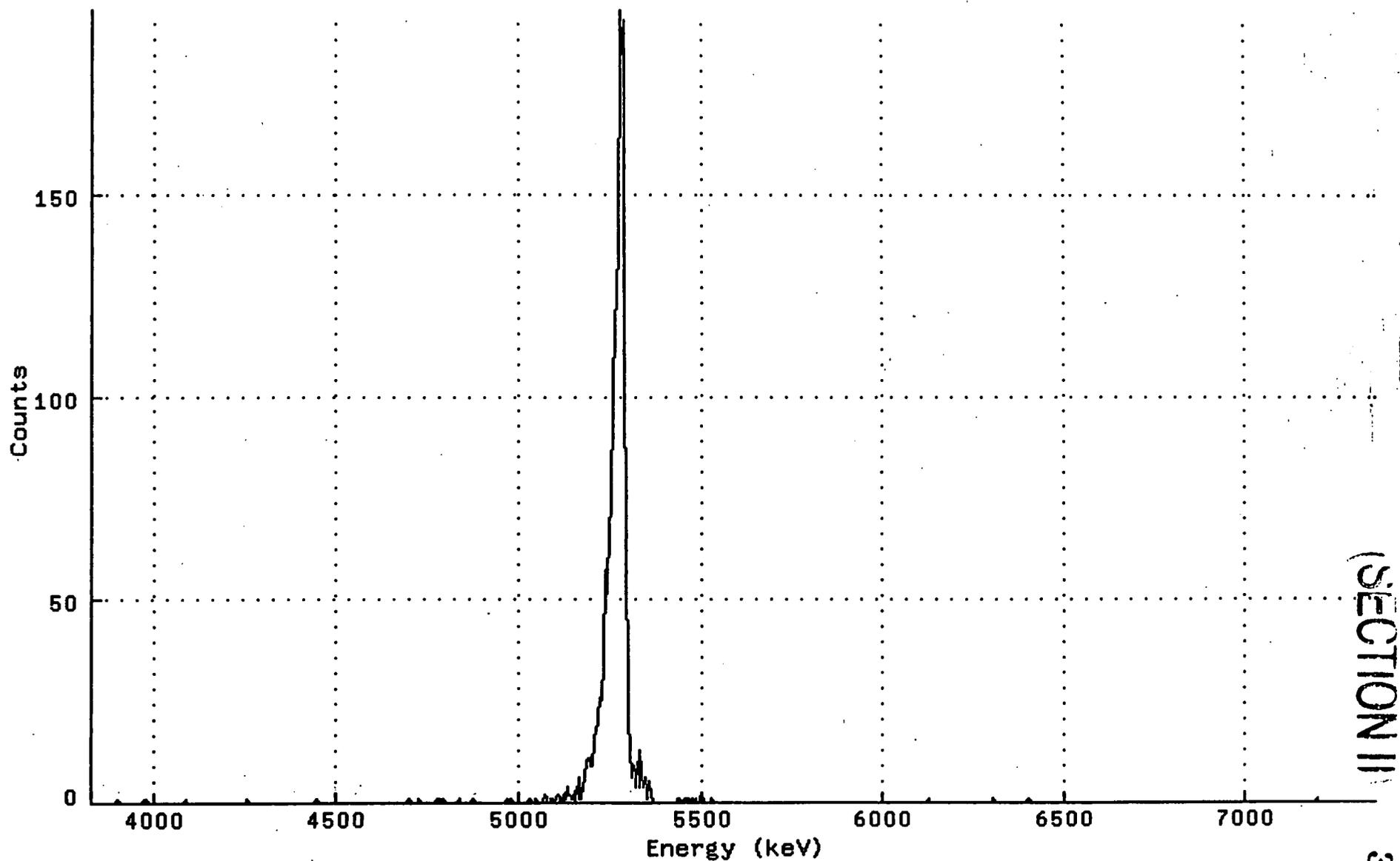
Title : 045

Sample Title:

Start Time: 9-DEC-1999 09:52: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.82089E+03

Real Time : 0 22:13:23.00 Sample ID : 263926 Energy Slope : 3.45370E+00

Live Time : 0 22:13:23.00 Sample Type: AM Energy Quad : 0.00000E+00



206

34

Spectral File: ND_AMS_ARCHIVE_S:S_99126522\$263927_AM.CNF

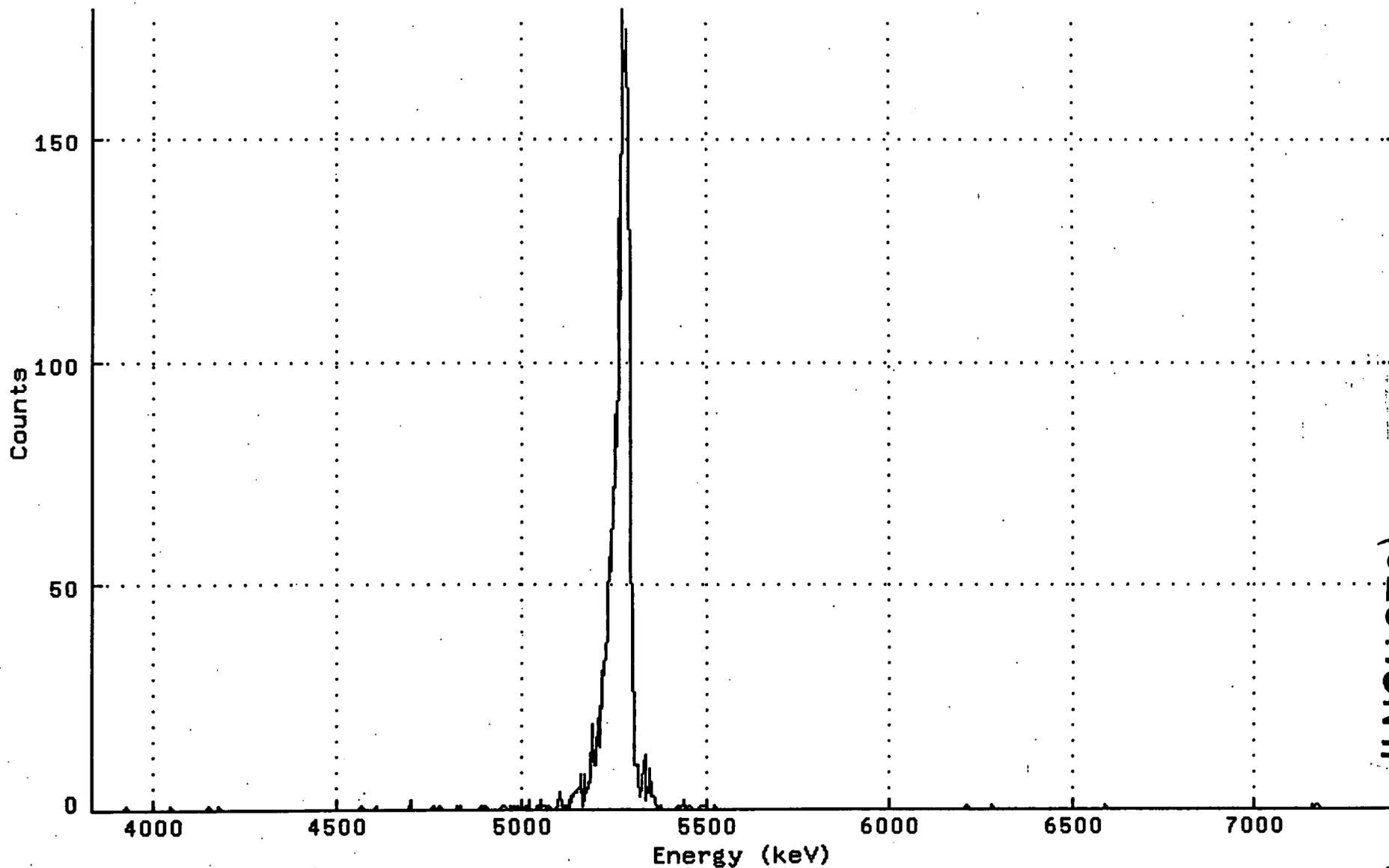
BATCH ID:	99126522	*	SAMPLE ID:	263927
SAMPLE DATE:	29-NOV-1999 00:00	*	ALIQUOT:	5.500E-02 SA
SAMPLE TITLE:		*	DETECTOR NUMBER:	046
ACQ DATE:	9-DEC-1999 09:52	*	AVERAGE EFFICIENCY:	23.6%
ELAPSED LIVE TIME:	80003.	*	RECOVERY:	72.31%
TRACER ID:	AM243_82-76-2	*	TRACER FWHM (kev):	33.59
LAMBDA VALUE:	100.	*	ROI TYPE:	MANUAL
CORRECTED TRACER DPM:	11.270	*	CONFIDENCE LEVEL:	4.65
SAMPLE MATRIX:	MISC	*	LLD CONSTANT:	2.71
ENERGY CAL DATE:	3-DEC-1999 07:14	*	EFF CAL DATE:	3-DEC-1999 07:14
BKG FILENAME:	B_046_3DEC99	*		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/SA	TPU/ERROR 2-SIGMA	MDC dpm/SA	CRIT LEVEL dpm/SA
AM-241	5479.1	5.20	0.80	99.9	4.150E-01	4.019E-01	5.482E-01	3.822E-01
AM243	5270.0	2559.60	2.40	99.6	2.049E+02	9.655E+00	7.937E-01	5.053E-01

** POSITIVE **
** RECOUNT SAMPLE CL > 0.067 **

Spectrum : WIZARD\$DKC200: [AHIGH.ALUSR.ARCHIVE.S]S_99126522\$263927_AM.CNF; 1
Title : 046
Sample Title:
Start Time: 9-DEC-1999 09:52: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.82498E+03
Real Time : 0 22:13:23.00 Sample ID : 263927 Energy Slope : 3.45799E+00
Live Time : 0 22:13:23.00 Sample Type: AM Energy Quad : 0.00000E+00

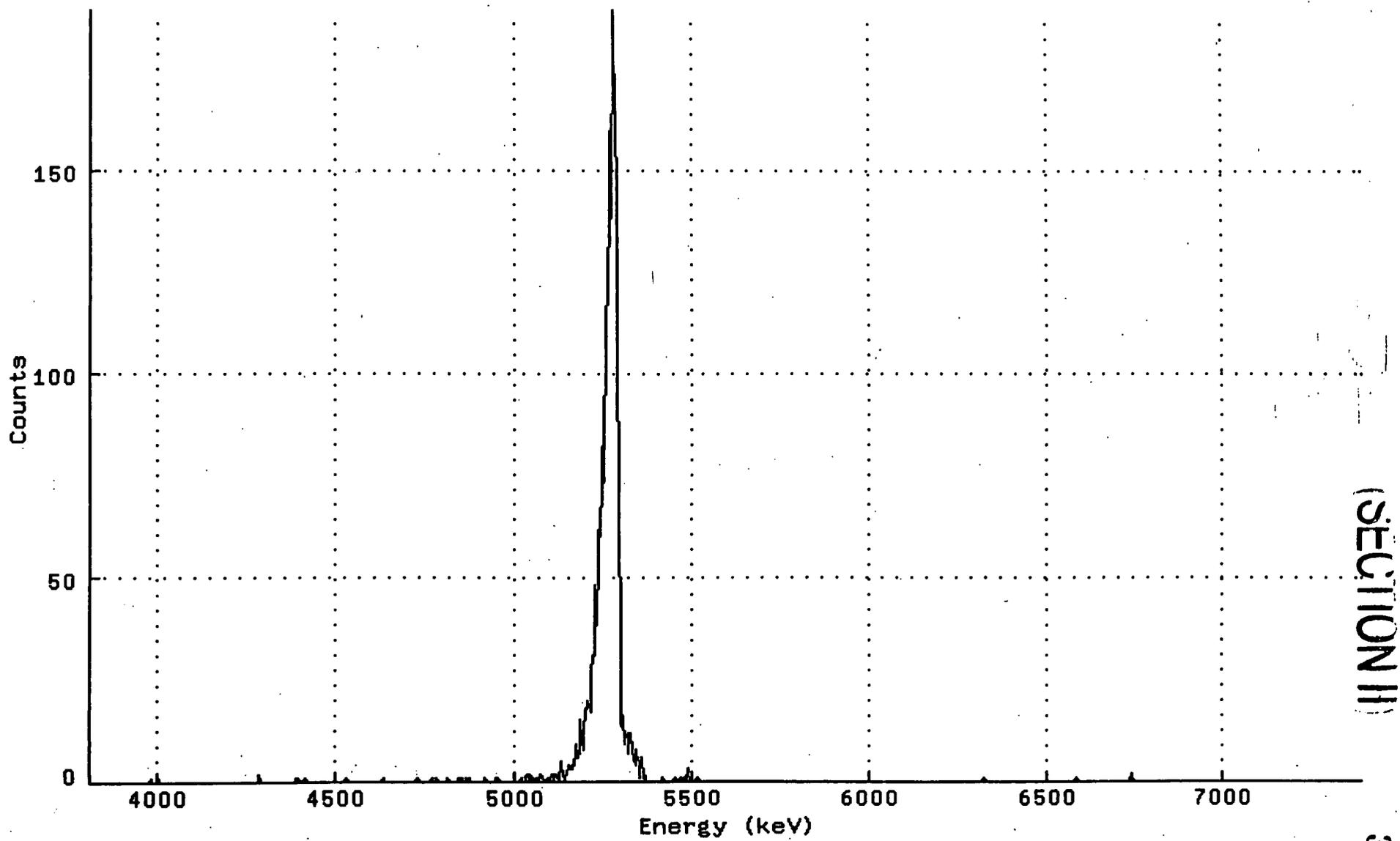


(SECTION II)

36

208

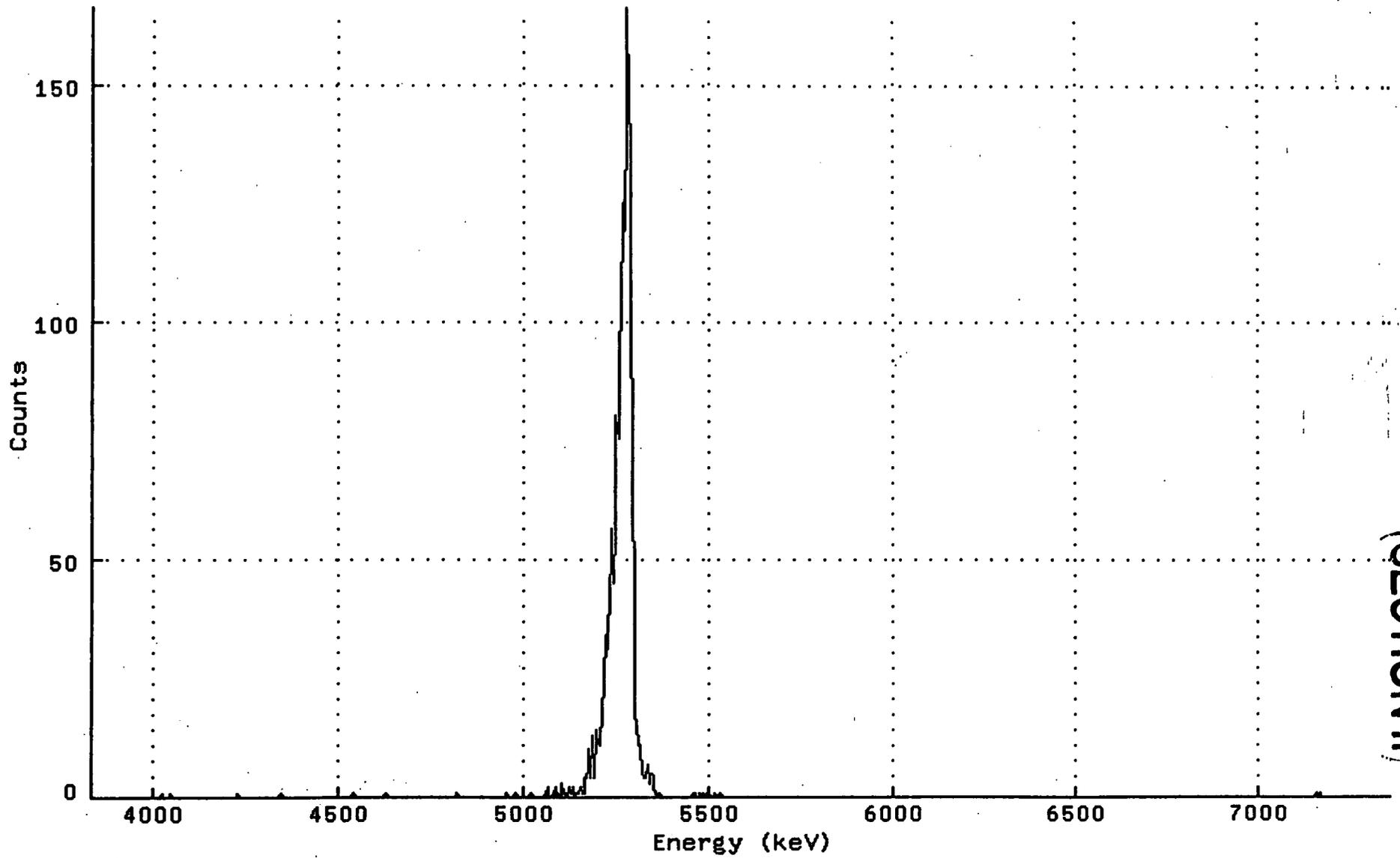
Spectrum : WIZARD\$DKC200: [AHIGH.ALUSR.ARCHIVE.S]S_99126522\$263928_AM.CNF; 1
Title : 047
Sample Title:
Start Time: 9-DEC-1999 09:52: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.79994E+03
Real Time : 0 22:13:23.00 Sample ID : 263928 Energy Slope : 3.50515E+00
Live Time : 0 22:13:23.00 Sample Type: AM Energy Quad : 0.00000E+00



(SECTION II)

210

Spectrum : WIZARD\$DKC200: [AHIGH.ALUSR.ARCHIVE.S]S_99126522\$263929_AM.CNF; 1
Title : 048
Sample Title:
Start Time: 9-DEC-1999 09:53: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.82185E+03
Real Time : 0 22:13:24.00 Sample ID : 263929 Energy Slope : 3.45055E+00
Live Time : 0 22:13:24.00 Sample Type: AM Energy Quad : 0.00000E+00

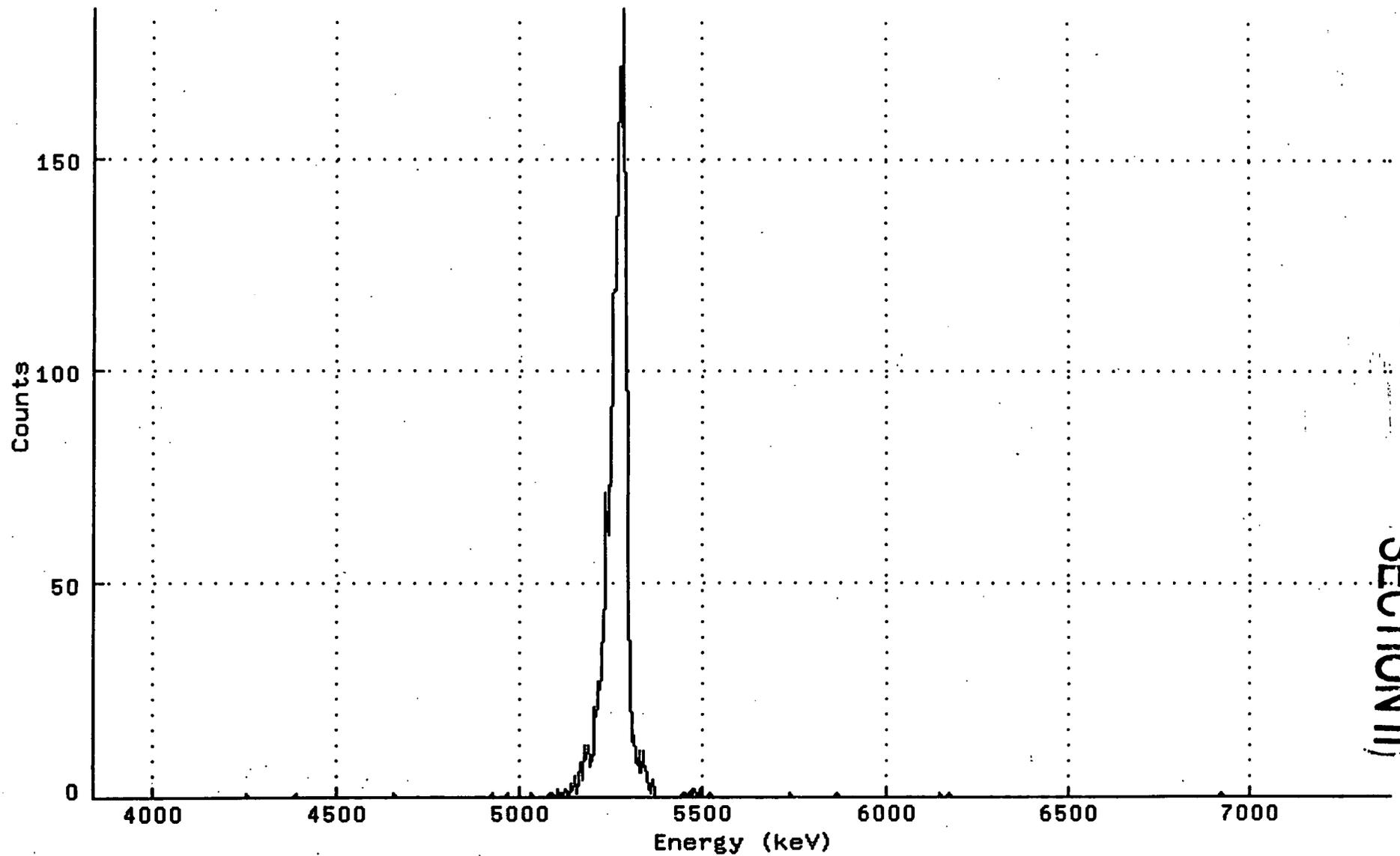


(SECTION II)

212

40

Spectrum : WIZARD\$DKC200: [AHIGH.ALUSR.ARCHIVE.S]S_99126522\$263930_AM.CNF; 1
Title : 037
Sample Title:
Start Time: 10-DEC-1999 09:01 Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.82918E+03
Real Time : 0 22:13:20.00 Sample ID : 263930 Energy Slope : 3.47146E+00
Live Time : 0 22:13:20.00 Sample Type: AM Energy Quad : 0.00000E+00



214

SECTION II)

42

Spectral File: ND_AMS_ARCHIVE_S:S_99126522\$263921D_AM.CNF

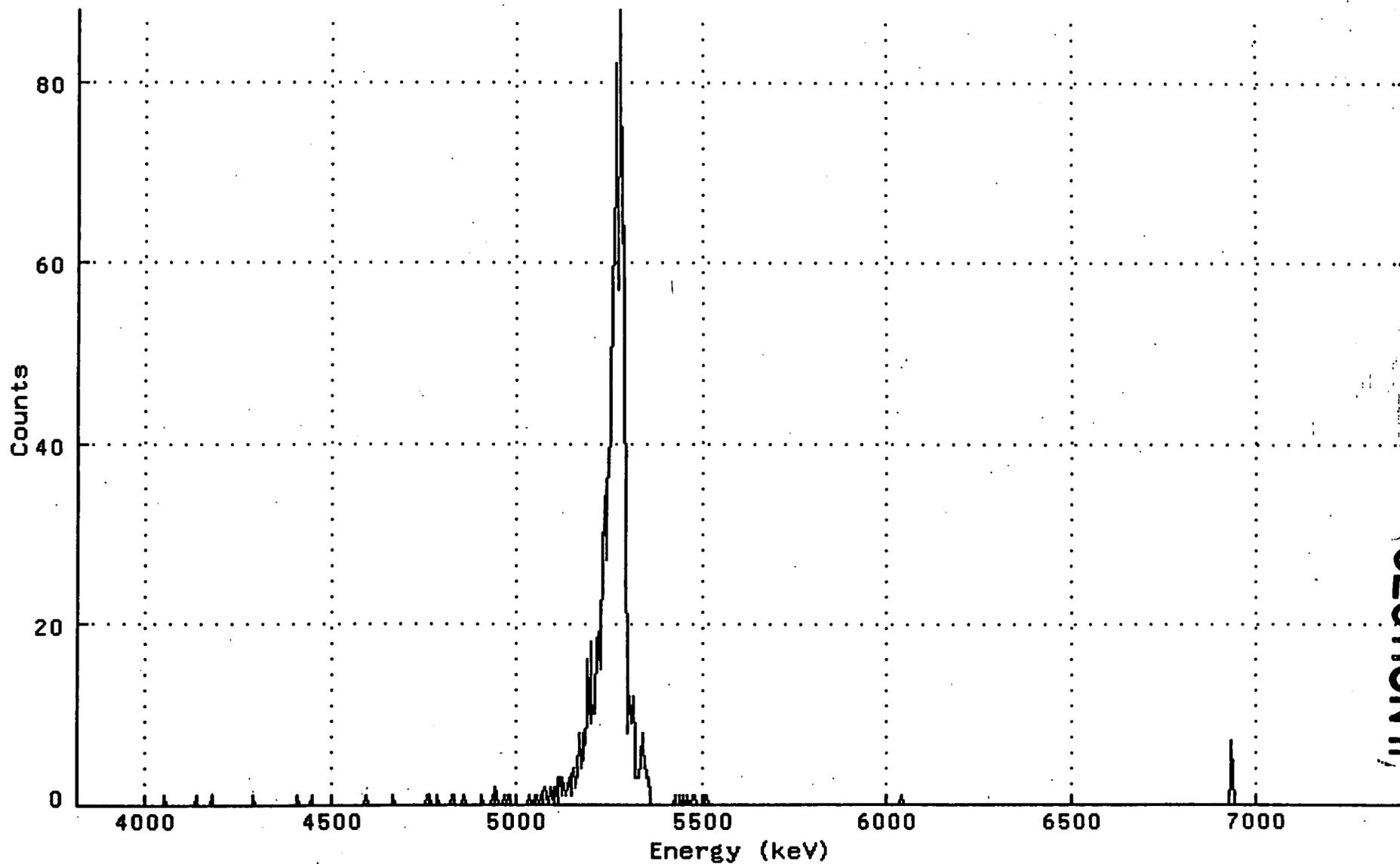
BATCH ID: 99126522 * SAMPLE ID: 263921D
SAMPLE DATE: 29-NOV-1999 00:00 * ALIQUOT: 3.930E-02 SA
SAMPLE TITLE: * DETECTOR NUMBER: 038
ACQ DATE: 10-DEC-1999 09:01 * AVERAGE EFFICIENCY: 23.3%
ELAPSED LIVE TIME: 80001. * RECOVERY: 37.77%
TRACER ID: AM243_82-76-2 * TRACER FWHM (kev): 36.67
LAMBDA VALUE: 100. * ROI TYPE: MANUAL
CORRECTED TRACER DPM: 11.270 * CONFIDENCE LEVEL: 4.65
SAMPLE MATRIX: MISC * LLD CONSTANT: 2.71
ENERGY CAL DATE: 3-DEC-1999 06:57 * EFF CAL DATE: 3-DEC-1999 06:57
BKG FILENAME: B_038_3DEC99 *
*

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/ SA	TPU/ERROR 2-SIGMA	MDC dpm/ SA	CRIT LEVEL dpm/ SA
AM-241	5479.1	7.00	0.00	99.9	1.522E+00	1.155E+00	5.892E-01	5.892E-01
AM243	5270.0	1314.80	1.20	99.6	2.868E+02	1.744E+01	1.702E+00	1.147E+00

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.067 ***

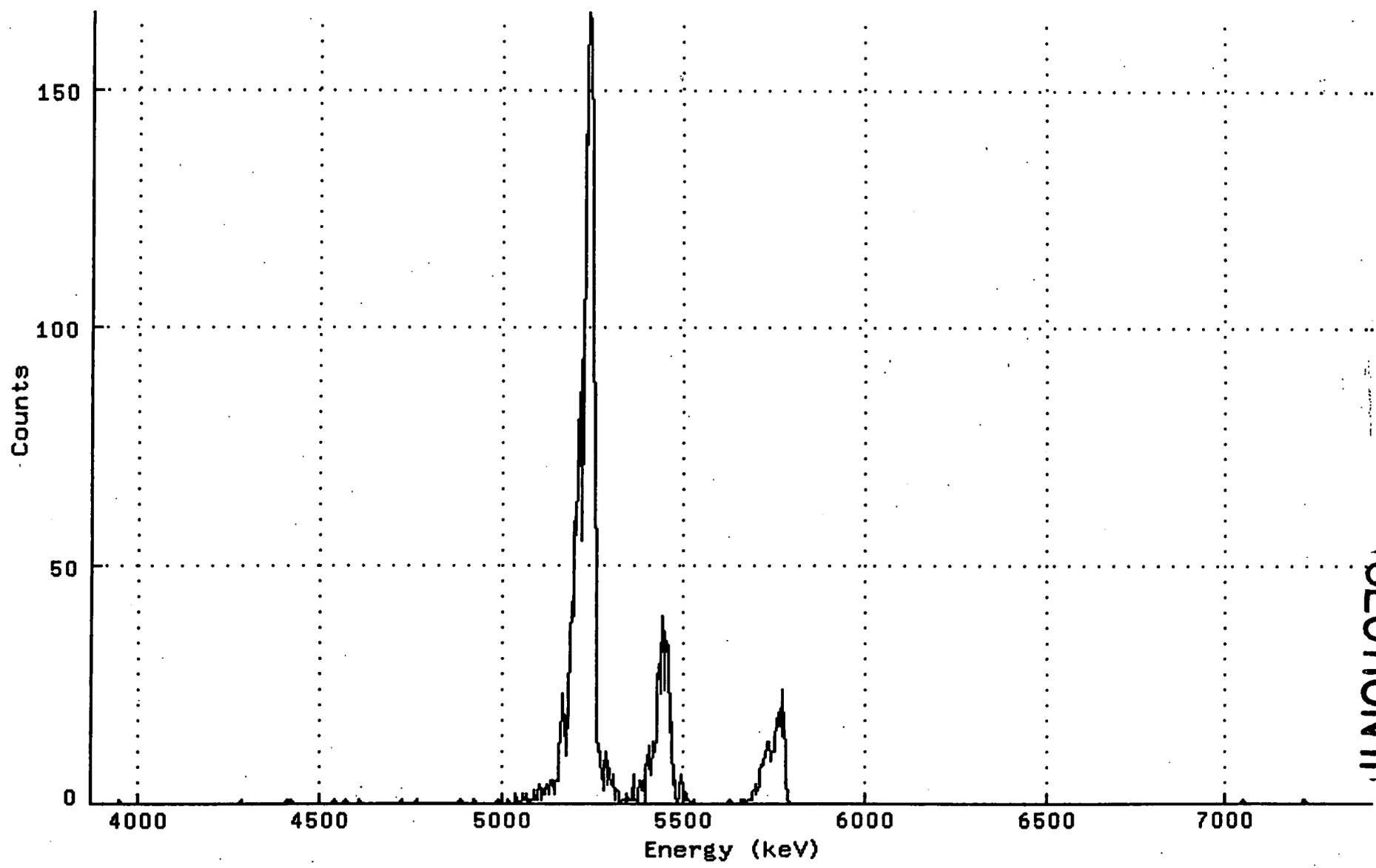
Spectrum : WIZARD\$DKC200: [AHIGH.ALUSR.ARCHIVE.S]S_99126522\$263921D_AM.CNF; 2
Title : 038
Sample Title:
Start Time: 10-DEC-1999 09:01 Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.80868E+03
Real Time : 0 22:13:21.00 Sample ID : 263921D Energy Slope : 3.49666E+00
Live Time : 0 22:13:21.00 Sample Type: AM Energy Quad : 0.00000E+00



SECTION II

216

Spectrum : WIZARD\$DKC200: [AHIGH.ALUSR.ARCHIVE.C]C_99126522\$LC3WR33_AM.CNF;1
Title : 039
Sample Title:
Start Time: 10-DEC-1999 09:01 Sample Time: 1-APR-1985 00:00: Energy Offset: 3.86215E+03
Real Time : 0 22:13:22.00 Sample ID : LC3WR33 Energy Slope : 3.45693E+00
Live Time : 0 22:13:22.00 Sample Type: AM Energy Quad : 0.00000E+00



(SECTION II)

218

46

Sample Preparation and Analysis Log

(SECTION II)

Sample Type: Various Solids

Method	Isotopes	Worklist Names	Chemist	Date	
Digestion & Purification	RC-19 R06	Am-241	99126525		12/7/99
		Pu-239/240, Pu-238	99126526		
		U-238, U235, U234	99126527		
Counting	RC-19 R06	Am ²⁴¹	99126525		12/13/99

Tracers (Internal Standards)

Isotope	ID	Conc(pCi/mL) @ RD	Aliquot(mL)	HL (years)	Activity(dpm)	Activity(pCi)
232	178-06-3	50.91 12/15/92	0.100	72	10.57	4.76
Am-243	82-76-2	50.80 12/15/92	0.100	7380	11.27	5.08
Pu-242	82-76-1	41.60 12/18/89	0.100	3.758E+05	9.24	4.16

Req	Sample ID	#	Aliquot Size	Comments/ Analysis	Sample Aliquot	Detector Number	Tare Weight(g)	Sample & Container(g)	Total Sample Size (g)
	PB	1	1 SA			41			
16848	263931	2	0.500 G		0.0631	42	14.612	22.537	7.925
16848	263932	3	0.500 G		0.0279	43	14.656	32.546	17.890
16848	263933	4	0.500 G		0.0418	44	14.692	26.665	11.973
16848	263934	5	0.500 G		0.0391	45	14.616	27.414	12.798
16848	263935	6	0.500 G		0.0328	46	14.529	29.793	15.264
16848	263936	7	0.500 G		0.0453	47	14.562	25.595	11.033
16848	263937	8	0.500 G		0.0389	48	14.530	27.384	12.854
16848	263938	9	0.500 G		0.0636	34	14.670	22.536	7.866
16848	263939	10	0.500 G		0.0461	35	14.535	25.378	10.843
16848	263940	11	0.500 G		0.0667	36	14.642	22.133	7.491
16848	263941	12	0.500 G		0.0376	37	14.702	27.993	13.291
16848	263942	13	0.500 G		0.0373	38	14.551	27.966	13.415
16848	263943	14	0.500 G		0.0523	39	14.562	24.115	9.553
16848	263944	15	0.500 G		0.0324	40	14.679	30.113	15.434
16848	263931D	16	0.500 G		0.0631	41	14.612	22.537	7.925
CSWR1, LCSWR33		17	0.250 mL			42			
		18							
		19							
		20							
		21							
		22							
		23							
		24							
		25							
		26							
		27							
		28							
		29							
		30							

Comments and Actual conditions:

-Start date: 12/1/99
 -Automatic pipets calibrated in accord with QC-6 on balance # 15
 -Balance # 5 used for weights of samples and their aliquots
 -Sample aliquot is the fraction of the total sample taken for analysis

Qidby
S. Spahr
 12/15/99
 01004
 12-11-99

Spectral File: ND_AMS_ARCHIVE_R:R_99126525\$PB_AM.CNF

```

*
BATCH ID:          99126525      *   SAMPLE ID:          PB
SAMPLE DATE:      29-NOV-1999 00:00 *   ALIQUOT:            1.000E+00 SA
SAMPLE TITLE:     *   DETECTOR NUMBER:        041
ACQ DATE:        10-DEC-1999 08:59 *   AVERAGE EFFICIENCY: 23.1%
ELAPSED LIVE TIME: 80000.        *   RECOVERY:           68.30%
TRACER ID:       AM243_82-76-2   *   TRACER FWHM (kev):  30.53
LAMBDA VALUE:    100.            *   ROI TYPE:           MANUAL
CORRECTED TRACER DPM: 11.270     *   CONFIDENCE LEVEL:  4.65
SAMPLE MATRIX:   MISC            *   LLD CONSTANT:      2.71
ENERGY CAL DATE: 3-DEC-1999 07:05 *   EFF CAL DATE:      3-DEC-1999 07:05
BKG FILENAME:    B_041_3DEC99   *
*

```

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/SA	TPU/ERROR 2-SIGMA	MDC dpm/SA	CRIT LEVEL dpm/SA
AM-241	5479.1	8.60	0.40	99.9	4.096E-02	2.892E-02	2.691E-02	1.991E-02
AM243	5270.0	2359.00	2.00	99.6	1.127E+01	5.471E-01	4.436E-02	2.866E-02

*** POSITIVE ***

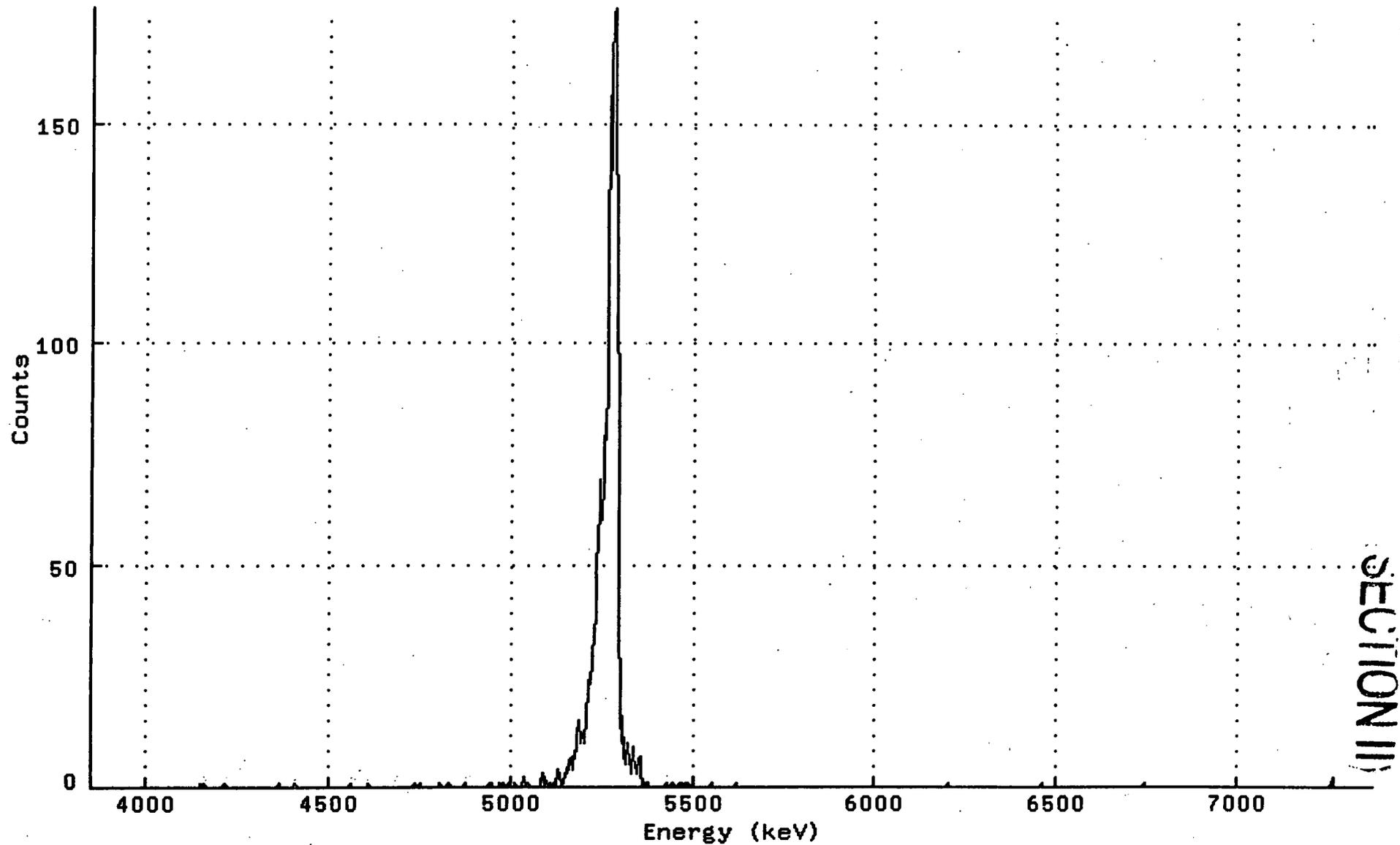
A
041
msa
027
029

Spectrum : WIZARD\$DKC200: [AHIGH.ALUSR.ARCHIVE.R]R_99126525\$PB_AM.CNF; 2

Title : 041

Sample Title:

Start Time: 10-DEC-1999 08:59 Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.83753E+03
Real Time : 0 22:13:20.00 Sample ID : PB Energy Slope : 3.45395E+00
Live Time : 0 22:13:20.00 Sample Type: AM Energy Quad : 0.00000E+00



SECTION II

221

 Spectral File: ND_AMS_ARCHIVE_S:S_99126525\$263931_AM.CNF

BATCH ID:	99126525	*	SAMPLE ID:	263931
SAMPLE DATE:	29-NOV-1999 00:00	*	ALIQUOT:	6.310E-02 SA
SAMPLE TITLE:		*	DETECTOR NUMBER:	042
ACQ DATE:	10-DEC-1999 08:59	*	AVERAGE EFFICIENCY:	23.6%
ELAPSED LIVE TIME:	80005.	*	RECOVERY:	62.83%
TRACER ID:	AM243_82-76-2	*	TRACER FWHM (kev):	33.37
LAMBDA VALUE:	100.	•	ROI TYPE:	MANUAL
CORRECTED TRACER DPM:	11.270	*	CONFIDENCE LEVEL:	4.65
SAMPLE MATRIX:	MISC	*	LLD CONSTANT:	2.71
ENERGY CAL DATE:	3-DEC-1999 07:08	*	EFF CAL DATE:	3-DEC-1999 07:08
BKG FILENAME:	B_042_3DEC99	*		

 NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/ SA	TPU/ERROR 2-SIGMA	MDC dpm/ SA	CRIT LEVEL dpm/ SA
AM-241	5479.1	3.80	1.20	99.9	3.051E-01	3.763E-01	6.265E-01	4.220E-01
AM243	5270.0	2217.80	1.20	99.6	1.786E+02	8.860E+00	6.285E-01	4.234E-01

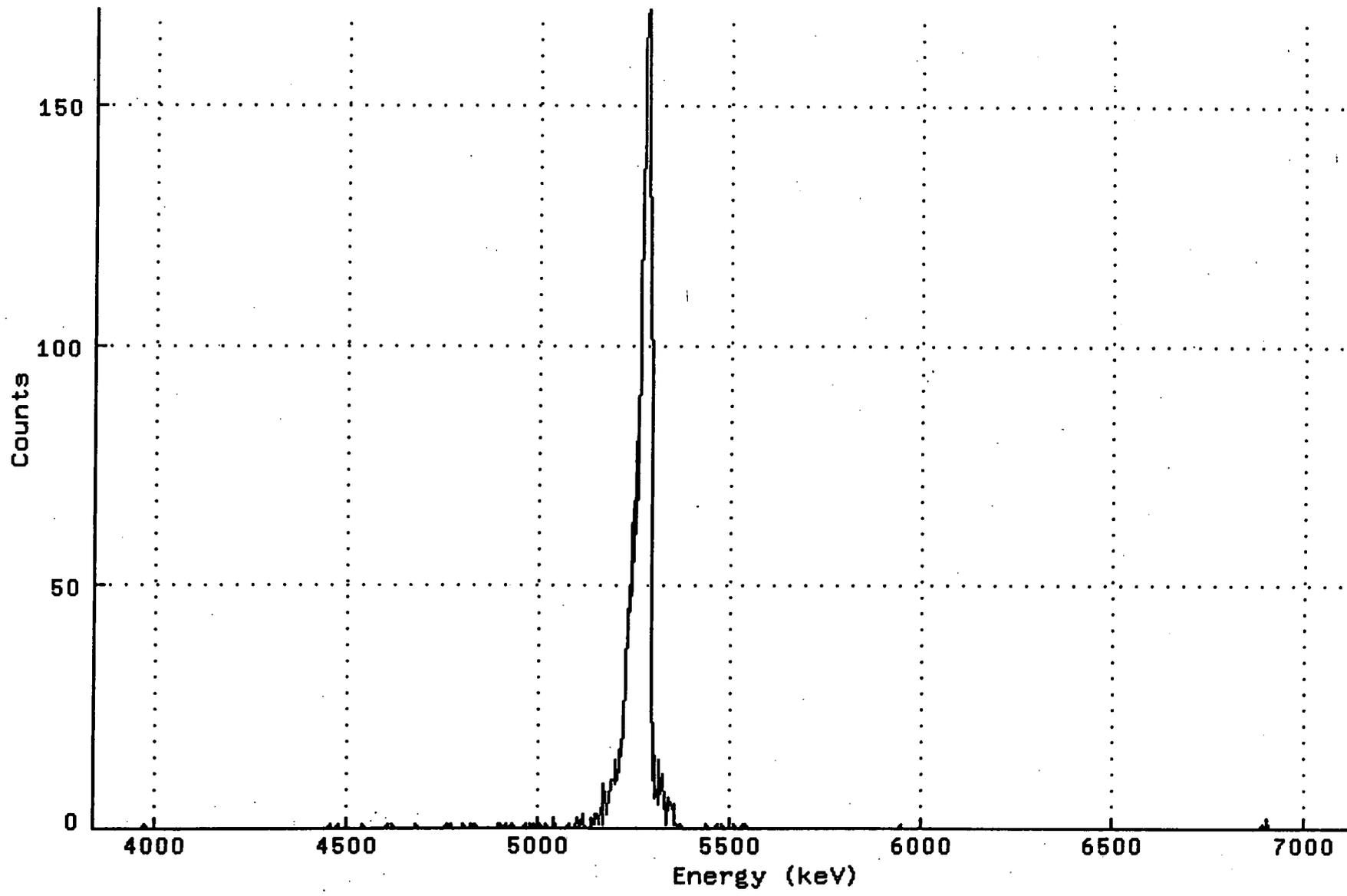
 *** RECOUNT SAMPLE CL > 0.067 ***

Spectrum : WIZARD\$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99126525\$263931_AM.CNF; 2

Title : 042

Sample Title:

Start Time: 10-DEC-1999 08:59 Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.83215E+03
Real Time : 0 22:13:25.00 Sample ID : 263931 Energy Slope : 3.43781E+00
Live Time : 0 22:13:25.00 Sample Type: AM Energy Quad : 0.00000E+00



SECTION II

51

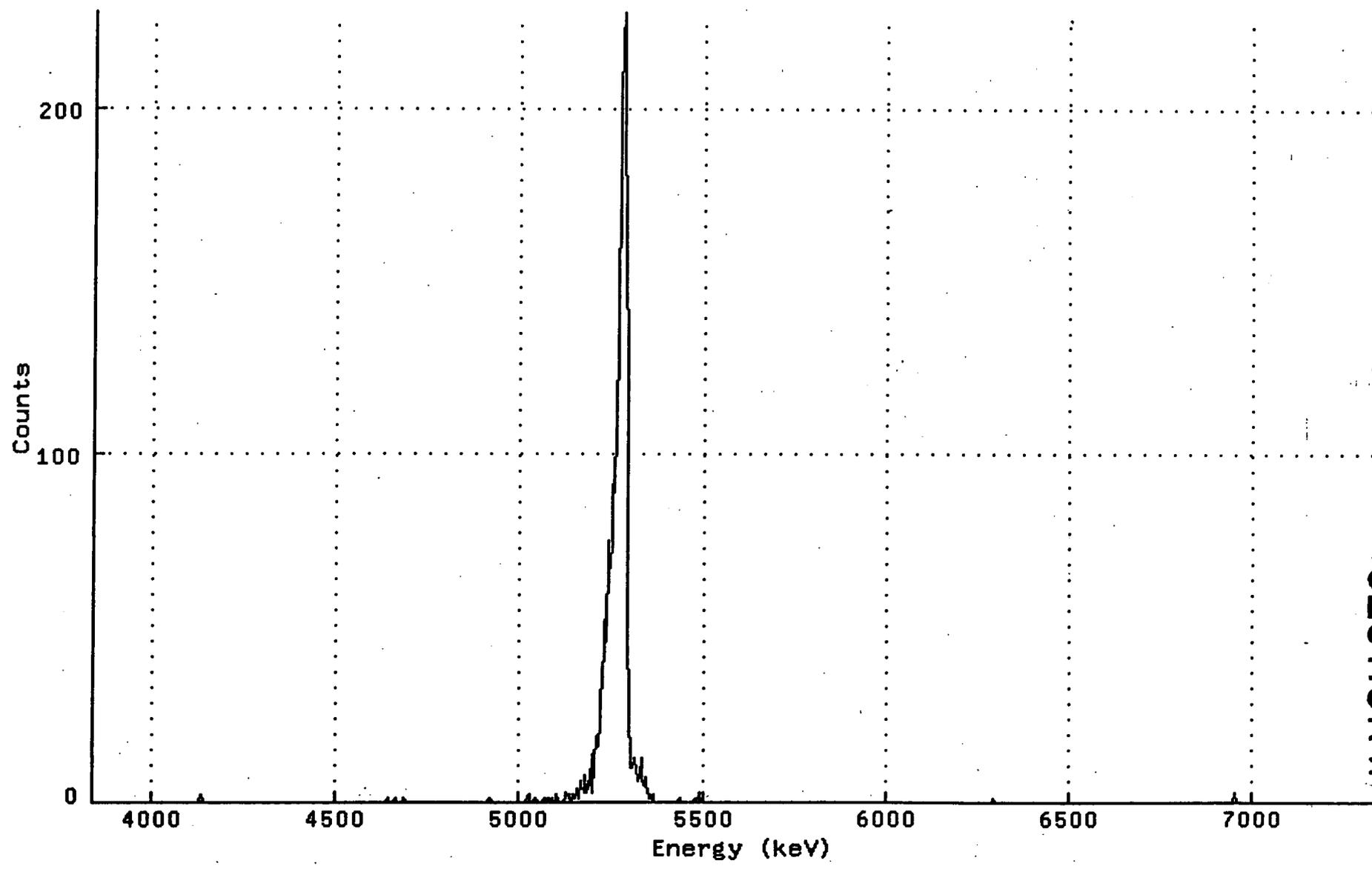
223

Spectrum : WIZARD\$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99126525\$263932_AM.CNF; 2

Title : 043

Sample Title:

Start Time: 10-DEC-1999 09:00	Sample Time: 29-NOV-1999 00:00	Energy Offset: 3.83028E+03
Real Time : 0 22:13:22.00	Sample ID : 263932	Energy Slope : 3.46730E+00
Live Time : 0 22:13:22.00	Sample Type: AM	Energy Quad : 0.00000E+00



SECTION III

 Spectral File: ND_AMS_ARCHIVE_S:S_99126525\$263933_AM.CNF

BATCH ID:	99126525	•	SAMPLE ID:	263933
SAMPLE DATE:	29-NOV-1999 00:00	*	ALIQUOT:	4.180E-02 SA
SAMPLE TITLE:		*	DETECTOR NUMBER:	044
ACQ DATE:	10-DEC-1999 09:00	*	AVERAGE EFFICIENCY:	22.8%
ELAPSED LIVE TIME:	80005.	*	RECOVERY:	77.48%
TRACER ID:	AM243_82-76-2	•	TRACER FWHM (kev):	36.96
LAMBDA VALUE:	100.	*	ROI TYPE:	MANUAL
CORRECTED TRACER DPM:	11.270	*	CONFIDENCE LEVEL:	4.65
SAMPLE MATRIX:	MISC	*	LLD CONSTANT:	2.71
ENERGY CAL DATE:	3-DEC-1999 07:11	*	EFF CAL DATE:	3-DEC-1999 07:11
BKG FILENAME:	B_044_3DEC99	*		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/	TPU/ERROR SA 2-SIGMA	MDC dpm/	CRIT LEVEL SA dpm/
AM-241	5479.1	3.60	0.40	99.9	3.660E-01	4.152E-01	5.745E-01	4.250E-01
AM243	5270.0	2643.60	2.40	99.6	2.696E+02	1.257E+01	1.011E+00	6.438E-01

*** RECOUNT SAMPLE CL > 0.067 ***

Spectrum : WIZARD\$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99126525\$263933_AM.CNF; 2

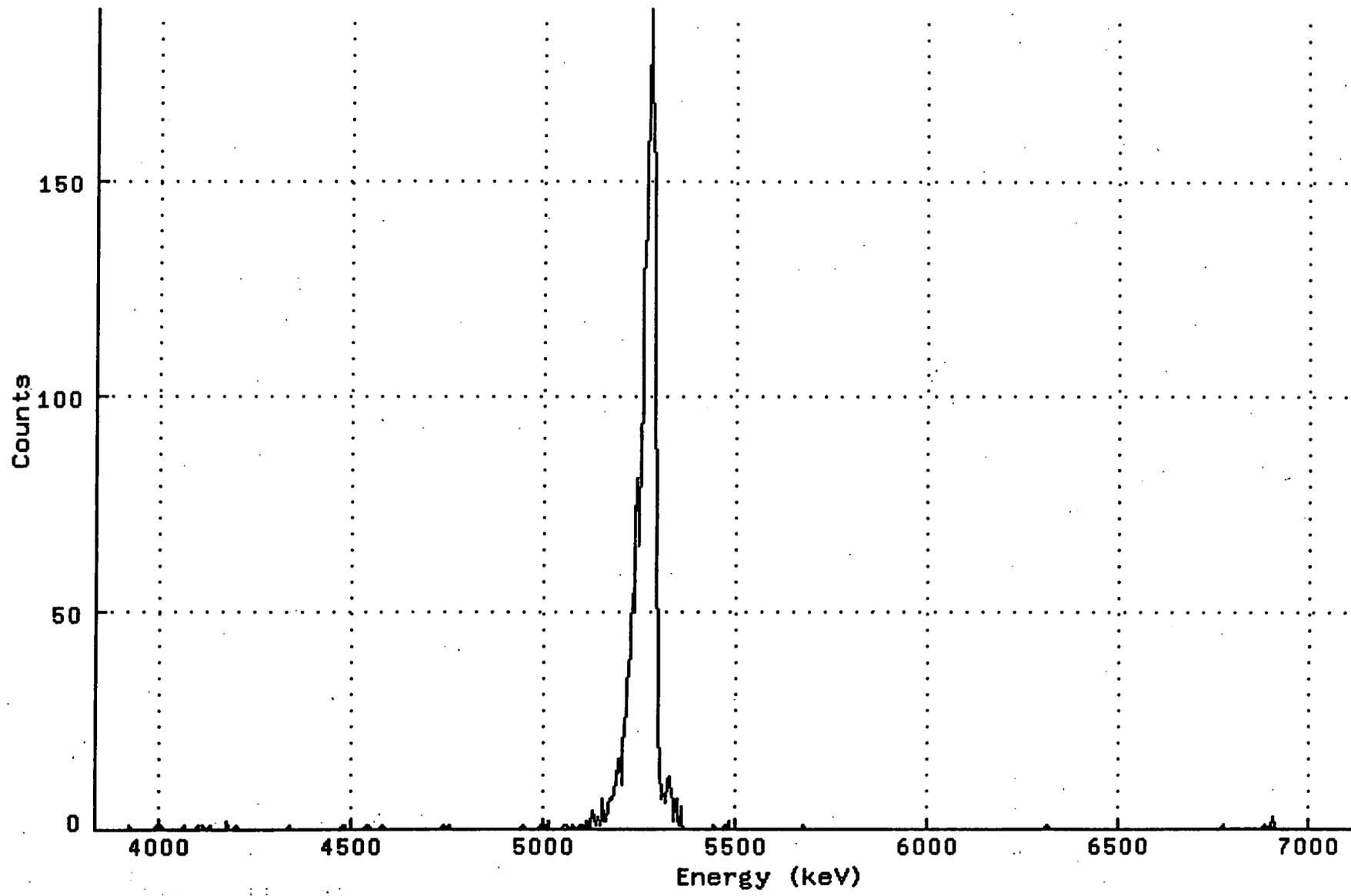
Title : 044

Sample Title:

Start Time: 10-DEC-1999 09:00 Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.82640E+03

Real Time : 0 22:13:25.00 Sample ID : 263933 Energy Slope : 3.44100E+00

Live Time : 0 22:13:25.00 Sample Type: AM Energy Quad : 0.00000E+00



SECTION II

55

227

Spectral File: ND_AMS_ARCHIVE_S:S_99126525\$263934_AM.CNF

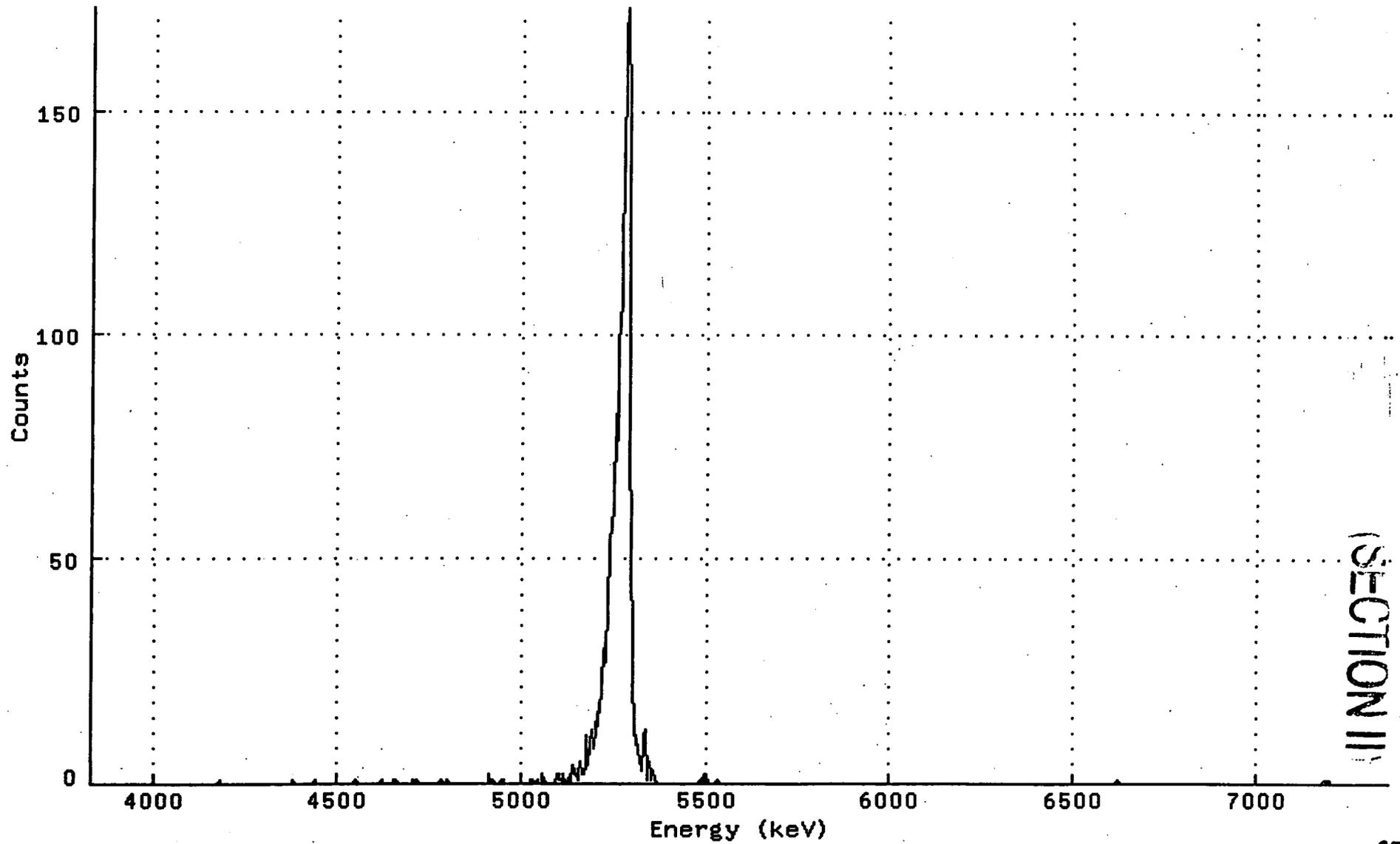
BATCH ID:	99126525	*	SAMPLE ID:	263934
SAMPLE DATE:	29-NOV-1999 00:00	*	ALIQUOT:	3.910E-02 SA
SAMPLE TITLE:		*	DETECTOR NUMBER:	045
ACQ DATE:	10-DEC-1999 09:00	*	AVERAGE EFFICIENCY:	23.5%
ELAPSED LIVE TIME:	80003.	*	RECOVERY:	63.61%
TRACER ID:	AM243_82-76-2	*	TRACER FWHM (kev):	32.37
LAMBDA VALUE:	100.	*	ROI TYPE:	MANUAL
CORRECTED TRACER DPM:	11.270	*	CONFIDENCE LEVEL:	4.65
SAMPLE MATRIX:	MISC	*	LLD CONSTANT:	2.71
ENERGY CAL DATE:	3-DEC-1999 07:13	*	EFF CAL DATE:	3-DEC-1999 07:13
BKG FILENAME:	B_045_3DEC99	•		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/SA	TPU/ERROR 2-SIGMA	MDC dpm/SA	CRIT LEVEL dpm/SA
AM-241	5479.1	6.60	0.40	99.9	8.469E-01	6.883E-01	7.251E-01	5.364E-01
AM243	5270.0	2239.20	0.80	99.6	2.882E+02	1.423E+01	8.842E-01	6.165E-01

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.067 ***

Spectrum : WIZARD\$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99126525\$263934_AM.CNF;2
Title : 045
Sample Title:
Start Time: 10-DEC-1999 09:00 Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.82089E+03
Real Time : 0 22:13:24.00 Sample ID : 263934 Energy Slope : 3.45370E+00
Live Time : 0 22:13:23.00 Sample Type: AM Energy Quad : 0.00000E+00



Spectral File: ND_AMS_ARCHIVE_S:S_99126525\$263935_AM.CNF

BATCH ID:	99126525	*	SAMPLE ID:	263935
SAMPLE DATE:	29-NOV-1999 00:00	*	ALIQUOT:	3.280E-02 SA
SAMPLE TITLE:		*	DETECTOR NUMBER:	046
ACQ DATE:	10-DEC-1999 09:00	*	AVERAGE EFFICIENCY:	23.6%
ELAPSED LIVE TIME:	80002.	*	RECOVERY:	65.05%
TRACER ID:	AM243_82-76-2	*	TRACER FWHM (kev):	43.90
LAMBDA VALUE:	100.	*	ROI TYPE:	MANUAL
CORRECTED TRACER DPM:	11.270	*	CONFIDENCE LEVEL:	4.65
SAMPLE MATRIX:	MISC	*	LLD CONSTANT:	2.71
ENERGY CAL DATE:	3-DEC-1999 07:14	*	EFF CAL DATE:	3-DEC-1999 07:14
BKG FILENAME:	B_046_3DEC99	*		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/	TPU/ERROR SA 2-SIGMA	MDC dpm/	CRIT LEVEL SA dpm/
AM-241	5479.1	6.60	0.40	99.9	9.818E-01	7.979E-01	8.406E-01	6.218E-01
AM243	5270.0	2302.60	2.40	99.6	3.436E+02	1.682E+01	1.479E+00	9.419E-01

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.067 ***

Spectrum : WIZARD\$DKC200: [AHIGH.ALUSR.ARCHIVE.S]S_99126525\$263935_AM.CNF; 2

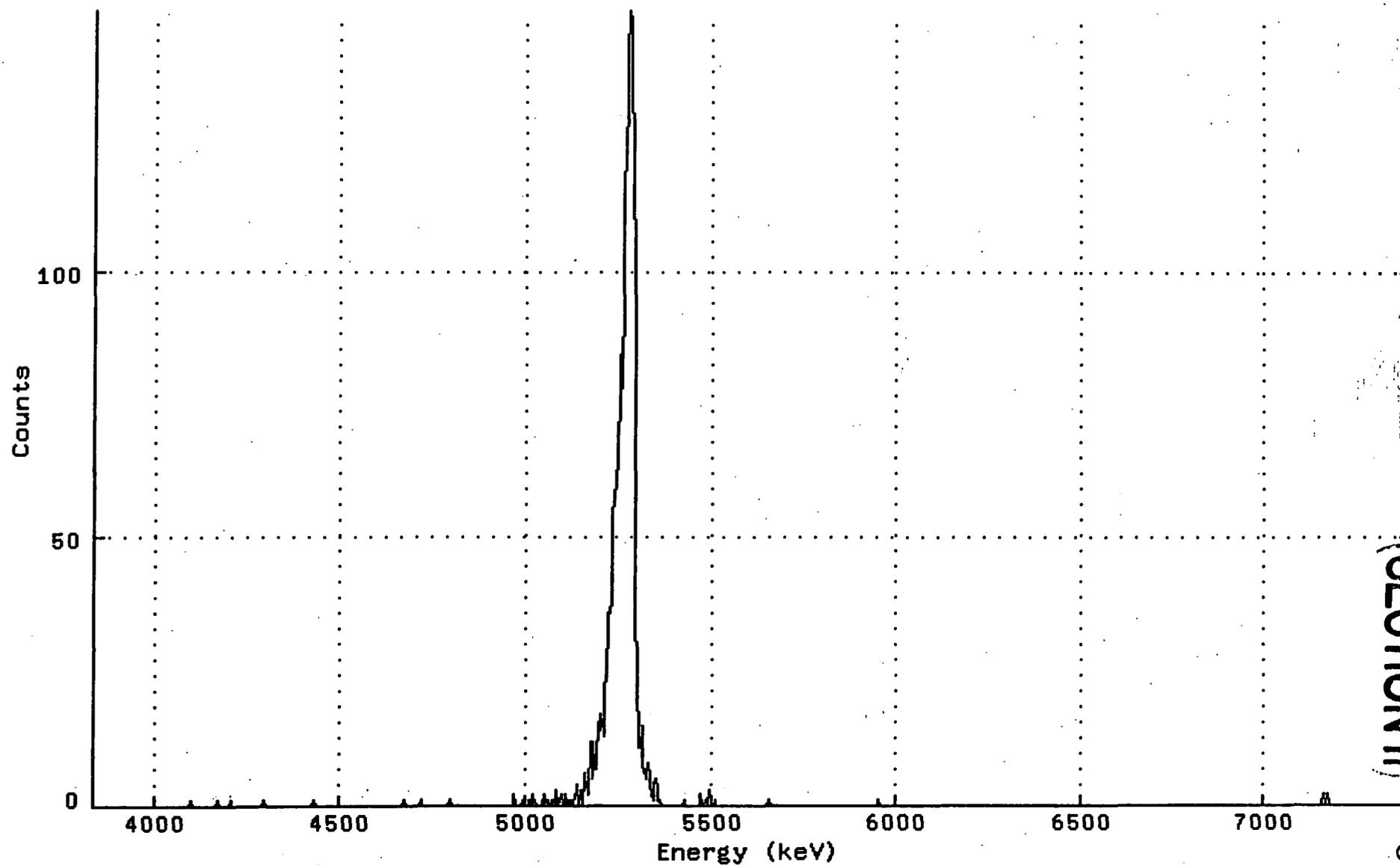
Title : 046

Sample Title:

Start Time: 10-DEC-1999 09:00 Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.82498E+03

Real Time : 0 22:13:22.00 Sample ID : 263935 Energy Slope : 3.45799E+00

Live Time : 0 22:13:22.00 Sample Type: AM Energy Quad : 0.00000E+00



(SECTION II)

59

231

Spectral File: ND_AMS_ARCHIVE_S:S_99126525\$263936_AM.CNF

```

*
BATCH ID:          99126525      *      SAMPLE ID:          263936
SAMPLE DATE:      29-NOV-1999 00:00 *      ALIQUOT:          4.530E-02      SA
SAMPLE TITLE:    *      DETECTOR NUMBER:      047
ACQ DATE:        10-DEC-1999 09:01 *      AVERAGE EFFICIENCY: 23.3%
ELAPSED LIVE TIME: 80002.      *      RECOVERY:          76.13%
TRACER ID:       AM243_82-76-2 *      TRACER FWHM (kev):  35.88
LAMBDA VALUE:    100.          *      ROI TYPE:          MANUAL
CORRECTED TRACER DPM: 11.270   *      CONFIDENCE LEVEL:  4.65
SAMPLE MATRIX:   MISC         *      LLD CONSTANT:      2.71
ENERGY CAL DATE: 3-DEC-1999 07:15 *      EFF CAL DATE:      3-DEC-1999 07:15
BKG FILENAME:    B_047_3DEC99 *
*

```

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/SA	TPU/ERROR 2-SIGMA	MDC dpm/SA	CRIT LEVEL dpm/SA
AM-241	5479.1	6.80	1.20	99.9	6.348E-01	5.447E-01	7.284E-01	4.907E-01
AM243	5270.0	2656.80	3.20	99.6	2.488E+02	1.157E+01	1.033E+00	6.432E-01

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.067 ***

Spectrum : WIZARD\$DKC200: [AHIGH.ALUSR.ARCHIVE.S]S_99126525\$263936_AM.CNF; 2

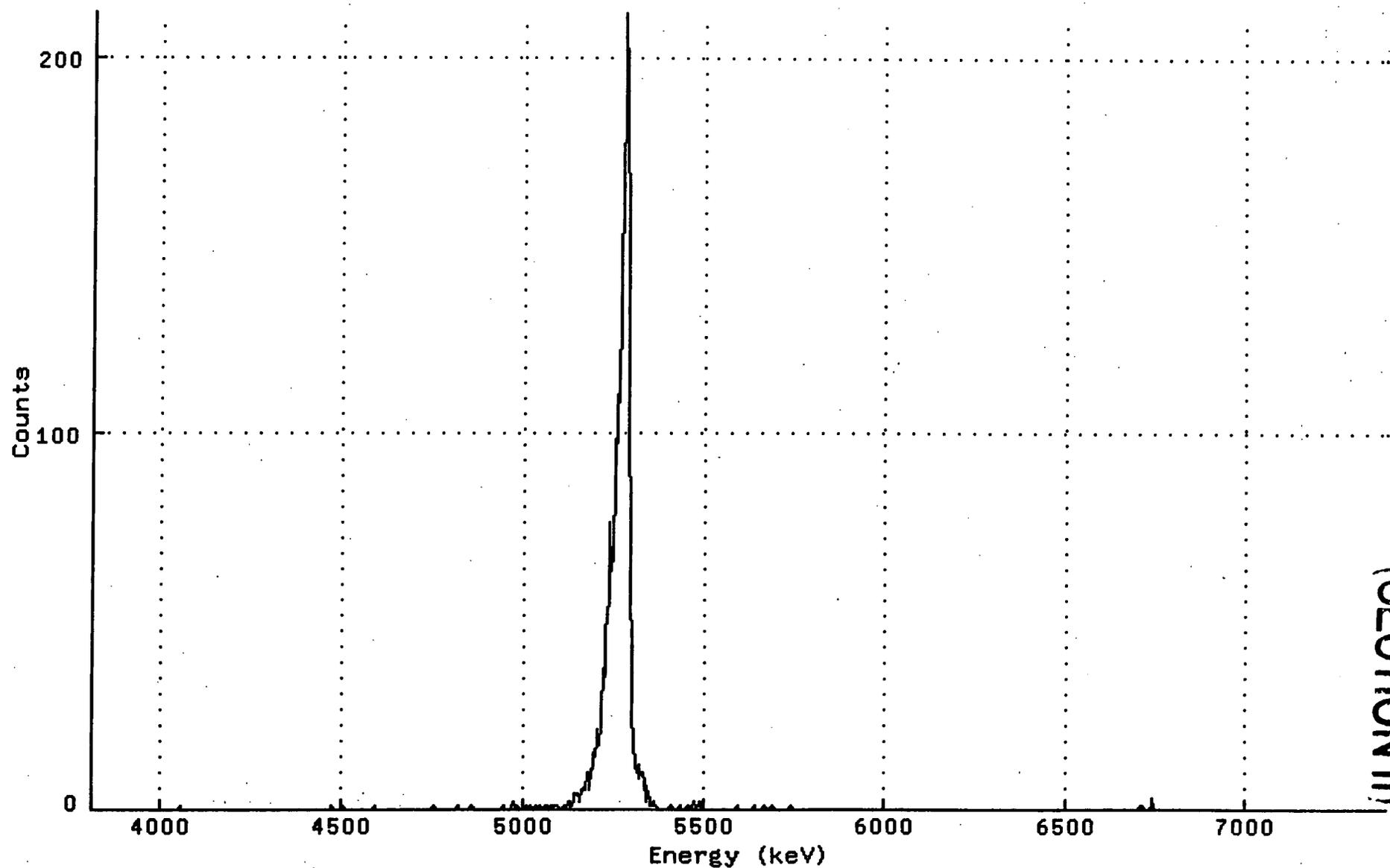
Title : 047

Sample Title:

Start Time: 10-DEC-1999 09:01 Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.79994E+03

Real Time : 0 22:13:22.00 Sample ID : 263936 Energy Slope : 3.50515E+00

Live Time : 0 22:13:22.00 Sample Type: AM Energy Quad : 0.00000E+00



(SECTION II)

233

Spectral File: ND_AMS_ARCHIVE_S:S_99126525\$263937_AM.CNF

BATCH ID: 99126525 * SAMPLE ID: 263937
SAMPLE DATE: 29-NOV-1999 00:00 * ALIQUOT: 3.890E-02 SA
SAMPLE TITLE: * DETECTOR NUMBER: 048
ACQ DATE: 10-DEC-1999 09:01 * AVERAGE EFFICIENCY: 22.7%
ELAPSED LIVE TIME: 80005. * RECOVERY: 62.88%
TRACER ID: AM243_82-76-2 * TRACER FWHM (kev): 45.73
LAMBDA VALUE: 100. * ROI TYPE: MANUAL
CORRECTED TRACER DPM: 11.270 * CONFIDENCE LEVEL: 4.65
SAMPLE MATRIX: MISC * LLD CONSTANT: 2.71
ENERGY CAL DATE: 3-DEC-1999 07:17 * EFF CAL DATE: 3-DEC-1999 07:17
BKG FILENAME: B_048_3DEC99 *
*

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/SA	TPU/ERROR 2-SIGMA	MDC dpm/SA	CRIT LEVEL dpm/SA
AM-241	5479.1	4.60	0.40	99.9	6.210E-01	6.144E-01	7.629E-01	5.644E-01
AM243	5270.0	2139.20	0.80	99.6	2.897E+02	1.456E+01	9.303E-01	6.487E-01

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.067 ***

Spectrum : WIZARD\$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99126525\$263937_AM.CNF; 2

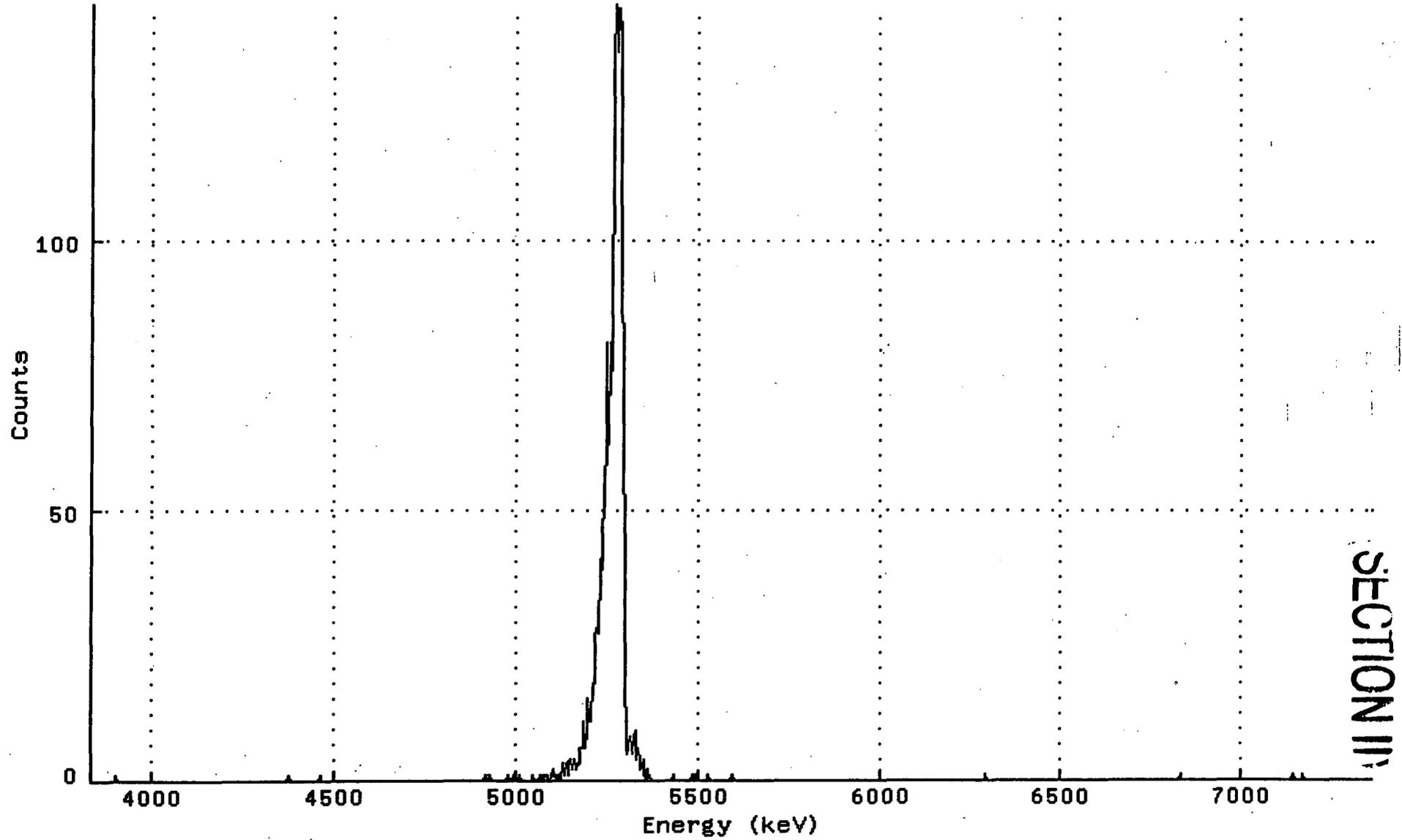
Title : 048

Sample Title:

Start Time: 10-DEC-1999 09:01 Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.82185E+03

Real Time : 0 22:13:25.00 Sample ID : 263937 Energy Slope : 3.45055E+00

Live Time : 0 22:13:25.00 Sample Type: AM Energy Quad : 0.00000E+00



SECTION II

63

235

 Spectral File: ND_AMS_ARCHIVE S:S_99126525\$263938_AM.CNF

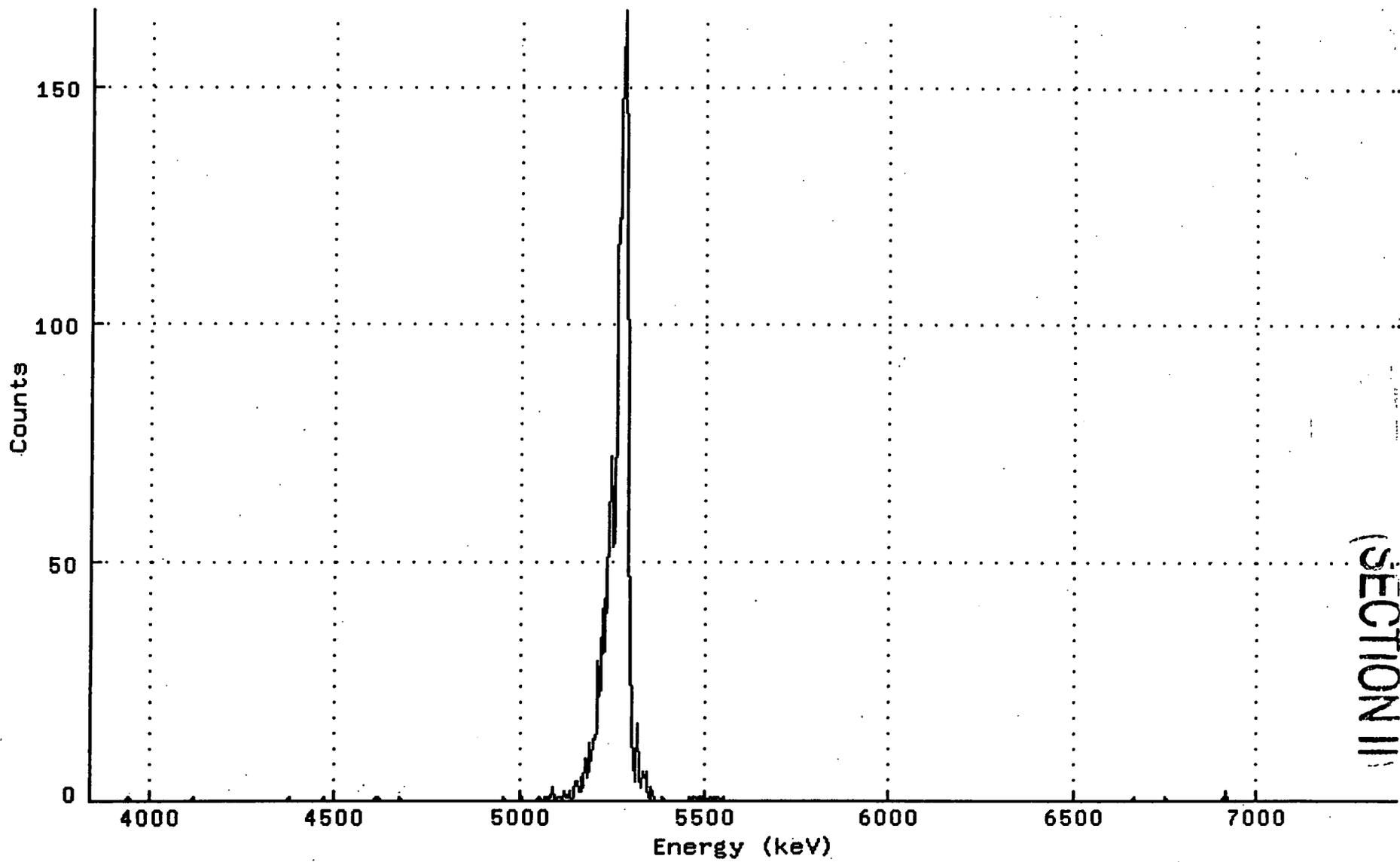
BATCH ID:	99126525	*	SAMPLE ID:	263938
SAMPLE DATE:	29-NOV-1999 00:00	*	ALIQUOT:	6.360E-02 SA
SAMPLE TITLE:		*	DETECTOR NUMBER:	034
ACQ DATE:	11-DEC-1999 10:21	*	AVERAGE EFFICIENCY:	22.1%
ELAPSED LIVE TIME:	80002.	*	RECOVERY:	66.60%
TRACER ID:	AM243_82-76-2	*	TRACER FWHM (kev):	31.12
LAMBDA VALUE:	100.	*	ROI TYPE:	MANUAL
CORRECTED TRACER DPM:	11.270	*	CONFIDENCE LEVEL:	4.65
SAMPLE MATRIX:	MISC	*	LLD CONSTANT:	2.71
ENERGY CAL DATE:	3-DEC-1999 06:51	*	EFF CAL DATE:	3-DEC-1999 06:51
BKG FILENAME:	B_034_3DEC99	*		

 NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/SA	TPU/ERROR 2-SIGMA	MDC dpm/SA	CRIT LEVEL dpm/SA
AM-241	5479.1	8.20	0.80	99.9	6.567E-01	4.904E-01	5.501E-01	3.835E-01
AM243	5270.0	2205.80	3.20	99.6	1.772E+02	8.826E+00	8.860E-01	5.518E-01

 *** POSITIVE ***
 *** RECOUNT SAMPLE CL > 0.067 ***

Spectrum : WIZARD\$DKC200: [AHIGH.ALUSR.ARCHIVE.S]S_99126525\$263938_AM.CNF; 2
Title : 034
Sample Title:
Start Time: 11-DEC-1999 10:21 Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.82875E+03
Real Time : 0 22:13:22.00 Sample ID : 263938 Energy Slope : 3.46609E+00
Live Time : 0 22:13:22.00 Sample Type: AM Energy Quad : 0.00000E+00



237

SECTION II

 Spectral File: ND_AMS_ARCHIVE_S:S_99126525\$263939_AM.CNF

BATCH ID:	99126525	*	SAMPLE ID:	263939
SAMPLE DATE:	29-NOV-1999 00:00	*	ALIQOT:	4.610E-02 SA
SAMPLE TITLE:		•	DETECTOR NUMBER:	035
ACQ DATE:	11-DEC-1999 10:21	*	AVERAGE EFFICIENCY:	26.3%
ELAPSED LIVE TIME:	80002.	•	RECOVERY:	62.02%
TRACER ID:	AM243_82-76-2	*	TRACER FWHM (kev):	33.52
LAMBDA VALUE:	100.	*	ROI TYPE:	MANUAL
CORRECTED TRACER DPM:	11.270	*	CONFIDENCE LEVEL:	4.65
SAMPLE MATRIX:	MISC	*	LLD CONSTANT:	2.71
ENERGY CAL DATE:	3-DEC-1999 06:53	•	EFF CAL DATE:	3-DEC-1999 06:53
BKG FILENAME:	B_035_3DEC99	•		
		*		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/SA	TPU/ERROR 2-SIGMA	MDC dpm/SA	CRIT LEVEL dpm/SA
AM-241	5479.1	6.60	0.40	99.9	6.584E-01	5.350E-01	5.637E-01	4.170E-01
AM243	5270.0	2443.00	2.00	99.6	2.445E+02	1.168E+01	9.293E-01	6.002E-01

*** POSITIVE ***
 *** RECOUNT SAMPLE CL > 0.067 ***

Spectrum : WIZARD\$DKC200:[AHIGH.ALUSR.ARCHIVE:S]S_99126525\$263939_AM.CNF; 2

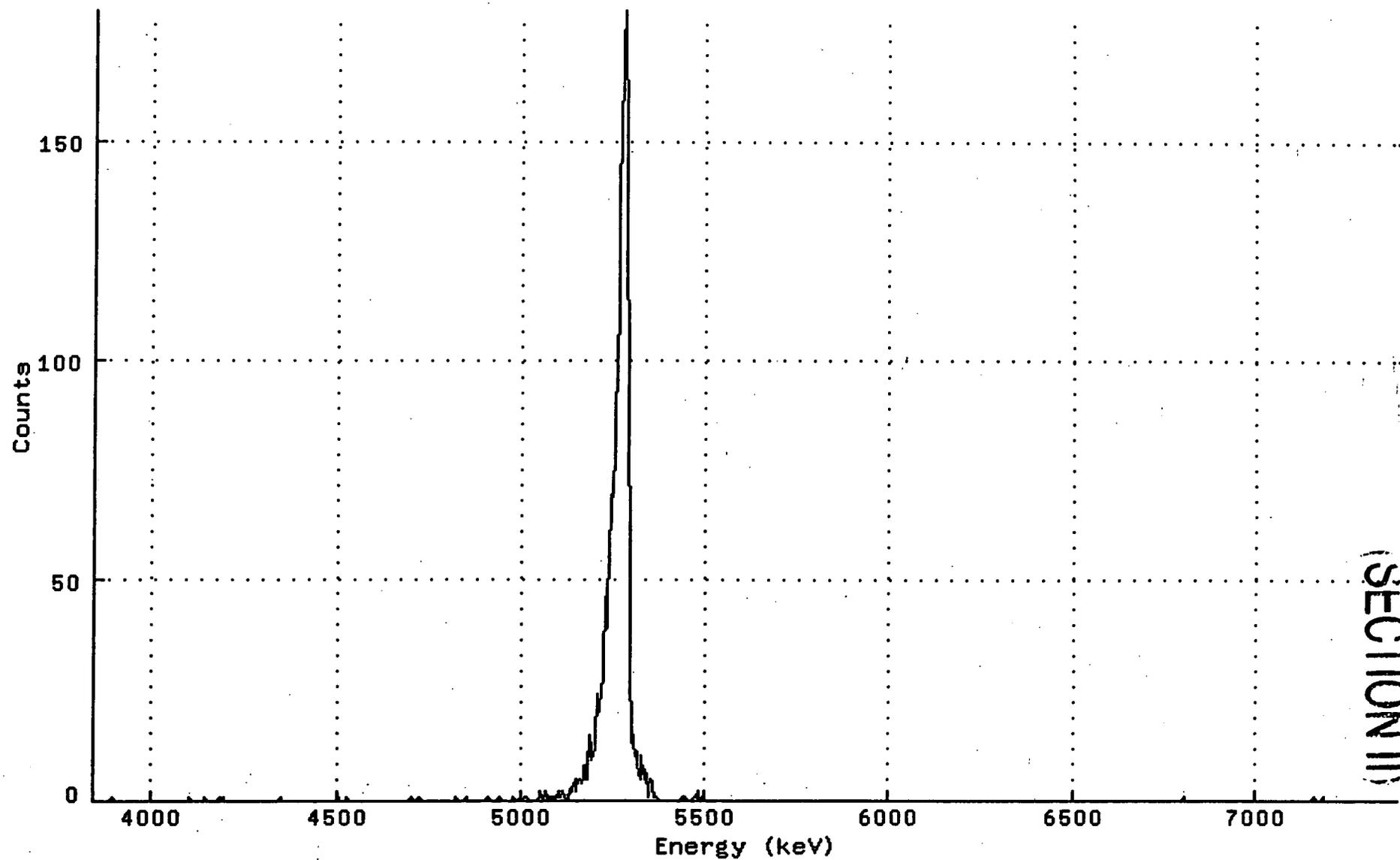
Title : 035

Sample Title:

Start Time: 11-DEC-1999 10:21 Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.83117E+03

Real Time : 0 22:13:22.00 Sample ID : 263939 Energy Slope : 3.47159E+00

Live Time : 0 22:13:22.00 Sample Type: AM Energy Quad : 0.00000E+00



239

(SECTION II)

Spectrum : WIZARD\$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99126525\$263940_AM.CNF; 2

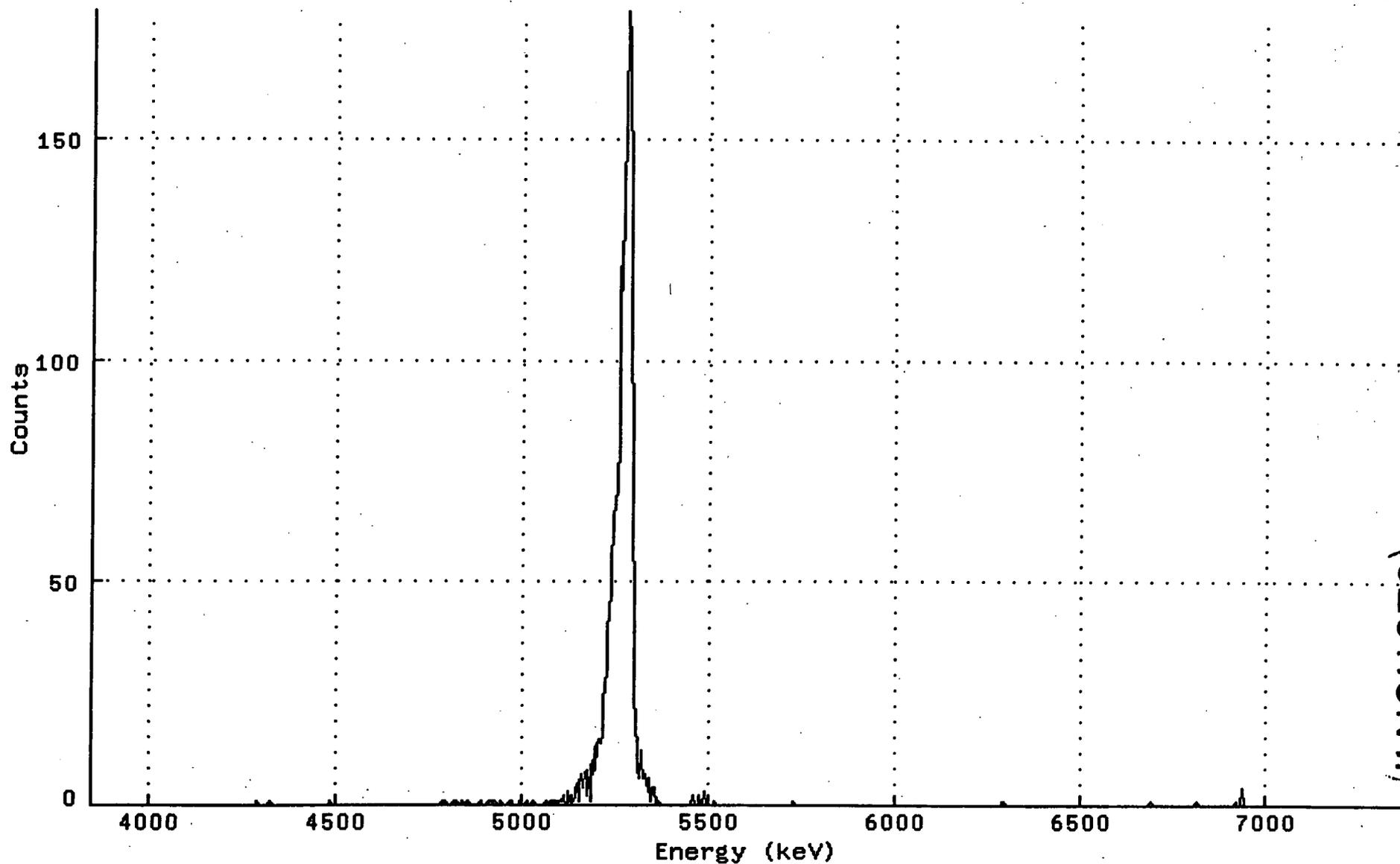
Title : 036

Sample Title:

Start Time: 11-DEC-1999 10:21 Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.83429E+03

Real Time : 0 22:13:24.00 Sample ID : 263940 Energy Slope : 3.44342E+00

Live Time : 0 22:13:24.00 Sample Type: AM Energy Quad : 0.00000E+00



(SECTION II)

 Spectral File: ND_AMS_ARCHIVE_S:S_99126525\$263941_AM.CNF

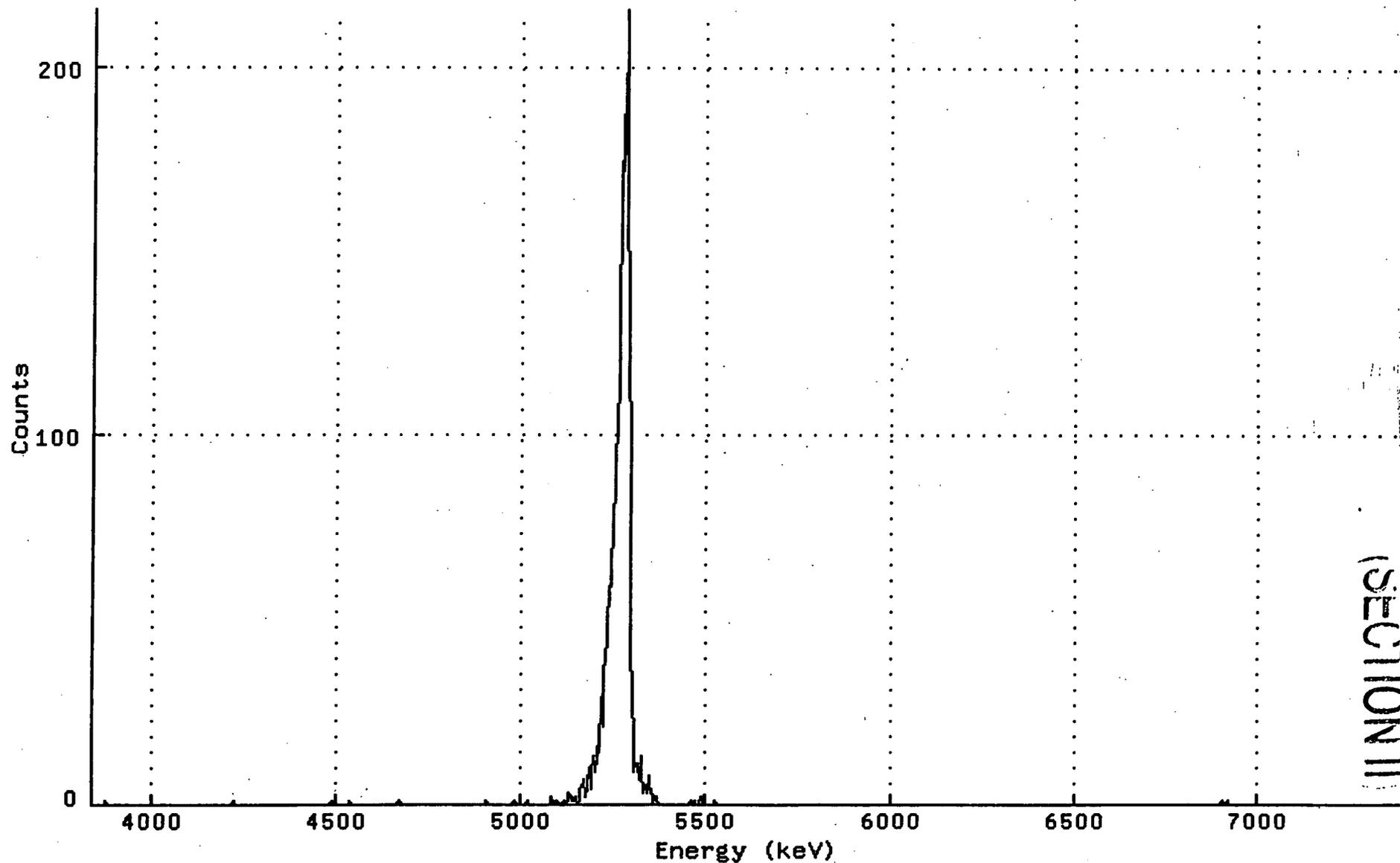
BATCH ID:	99126525	*	SAMPLE ID:	263941
SAMPLE DATE:	29-NOV-1999 00:00	*	ALIQOT:	3.760E-02 SA
SAMPLE TITLE:		*	DETECTOR NUMBER:	037
ACQ DATE:	11-DEC-1999 10:22	*	AVERAGE EFFICIENCY:	23.1%
ELAPSED LIVE TIME:	80003.	*	RECOVERY:	76.64%
TRACER ID:	AM243_82-76-2	*	TRACER FWHM (kev):	31.53
LAMBDA VALUE:	100.	*	ROI TYPE:	MANUAL
CORRECTED TRACER DPM:	11.270	*	CONFIDENCE LEVEL:	4.65
SAMPLE MATRIX:	MISC	*	LLD CONSTANT:	2.71
ENERGY CAL DATE:	3-DEC-1999 06:56	*	EFF CAL DATE:	3-DEC-1999 06:56
BKG FILENAME:	B_037_3DEC99	*		

 NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/	TPU/ERROR SA 2-SIGMA	MDC dpm/	CRIT LEVEL SA dpm/
AM-241	5479.1	5.00	0.00	99.9	5.638E-01	5.052E-01	3.056E-01	3.056E-01
AM243	5270.0	2649.80	1.20	99.6	2.997E+02	1.393E+01	8.828E-01	5.947E-01

 *** POSITIVE ***
 *** RECOUNT SAMPLE CL > 0.067 ***

Spectrum : WIZARD\$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99126525\$263941_AM.CNF;1
Title : 037
Sample Title:
Start Time: 11-DEC-1999 10:22 Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.82918E+03
Real Time : 0 22:13:23.00 Sample ID : 263941 Energy Slope : 3.47146E+00
Live Time : 0 22:13:23.00 Sample Type: AM Energy Quad : 0.00000E+00



(SECTION II)

243

 Spectral File: ND_AMS_ARCHIVE_S:S_99126525\$263942_AM.CNF

BATCH ID:	99126525	*	SAMPLE ID:	263942
SAMPLE DATE:	29-NOV-1999 00:00	*	ALIQOT:	3.730E-02 SA
SAMPLE TITLE:		*	DETECTOR NUMBER:	038
ACQ DATE:	11-DEC-1999 10:22	*	AVERAGE EFFICIENCY:	23.3%
ELAPSED LIVE TIME:	80003.	*	RECOVERY:	61.47%
TRACER ID:	AM243_82-76-2	*	TRACER FWHM (kev):	33.68
LAMBDA VALUE:	100.	*	ROI TYPE:	MANUAL
CORRECTED TRACER DPM:	11.270	•	CONFIDENCE LEVEL:	4.65
SAMPLE MATRIX:	MISC	•	LLD CONSTANT:	2.71
ENERGY CAL DATE:	3-DEC-1999 06:57	*	EFF CAL DATE:	3-DEC-1999 06:57
BKG FILENAME:	B_038_3DEC99	*		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/SA	TPU/ERROR 2-SIGMA	MDC dpm/SA	CRIT LEVEL dpm/SA
AM-241	5479.1	4.00	0.00	99.9	5.630E-01	5.639E-01	3.814E-01	3.814E-01
AM243	5270.0	2139.80	1.20	99.6	3.022E+02	1.518E+01	1.102E+00	7.423E-01

*** POSITIVE ***
 *** RECOUNT SAMPLE CL > 0.067 ***

Spectrum : WIZARD\$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99126525\$263942_AM.CNF;1

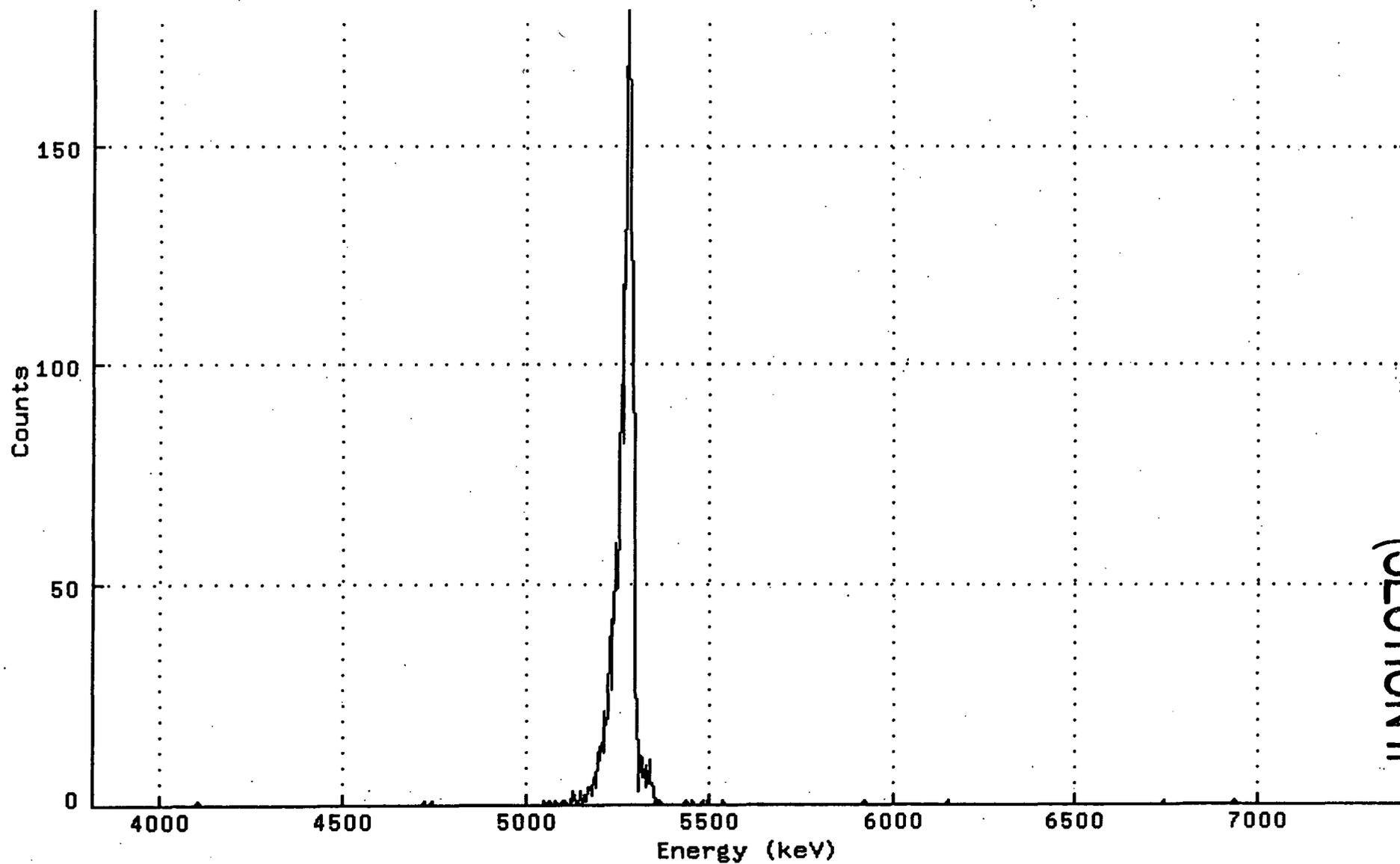
Title : 038

Sample Title:

Start Time: 11-DEC-1999 10:22 Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.80868E+03

Real Time : 0 22:13:23.00 Sample ID : 263942 Energy Slope : 3.49666E+00

Live Time : 0 22:13:23.00 Sample Type: AM Energy Quad : 0.00000E+00



(SECTION II)

Spectral File: ND_AMS_ARCHIVE_S:S_99126525\$263943_AM.CNF

```

*
BATCH ID:          99126525      *      SAMPLE ID:          263943
SAMPLE DATE:      29-NOV-1999 00:00 *      ALIQUOT:           5.230E-02      SA
SAMPLE TITLE:     *      DETECTOR NUMBER:       039
ACQ DATE:         11-DEC-1999 10:22 *      AVERAGE EFFICIENCY: 23.3%
ELAPSED LIVE TIME: 80001.        *      RECOVERY:           74.94%
TRACER ID:        AM243_82-76-2  *      TRACER FWHM (kev):  61.82
LAMBDA VALUE:     100.           *      ROI TYPE:           MANUAL
CORRECTED TRACER DPM: 11.270     *      CONFIDENCE LEVEL:   4.65
SAMPLE MATRIX:    MISC           *      LLD CONSTANT:       2.71
ENERGY CAL DATE:  3-DEC-1999 06:59 *      EFF CAL DATE:       3-DEC-1999 06:59
BKG FILENAME:     B_039_3DEC99   *
*

```

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/ SA	TPU/ERROR 2-SIGMA	MDC dpm/ SA	CRIT LEVEL dpm/ SA
AM-241	5479.1	5.20	0.80	99.9	4.267E-01	4.132E-01	5.636E-01	3.930E-01
AM243	5270.0	2618.00	4.00	99.6	2.155E+02	1.008E+01	9.886E-01	6.058E-01

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.067 ***

Spectrum : WIZARD\$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99126525\$263943_AM.CNF;1

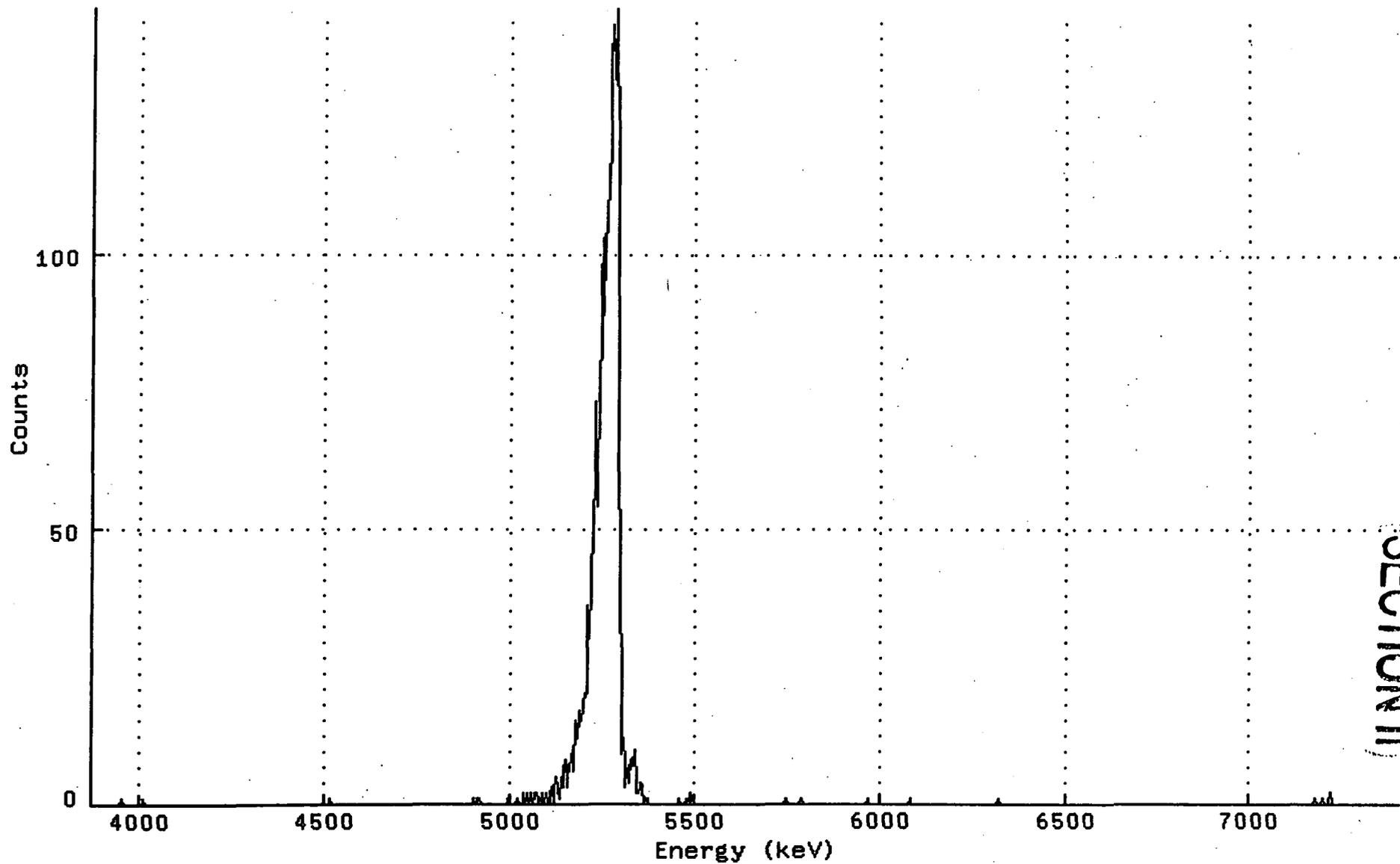
Title : 039

Sample Title:

Start Time: 11-DEC-1999 10:22 Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.86215E+03

Real Time : 0 22:13:22.00 Sample ID : 263943 Energy Slope : 3.45693E+00

Live Time : 0 22:13:21.00 Sample Type: AM Energy Quad : 0.00000E+00



247

SECTION II)

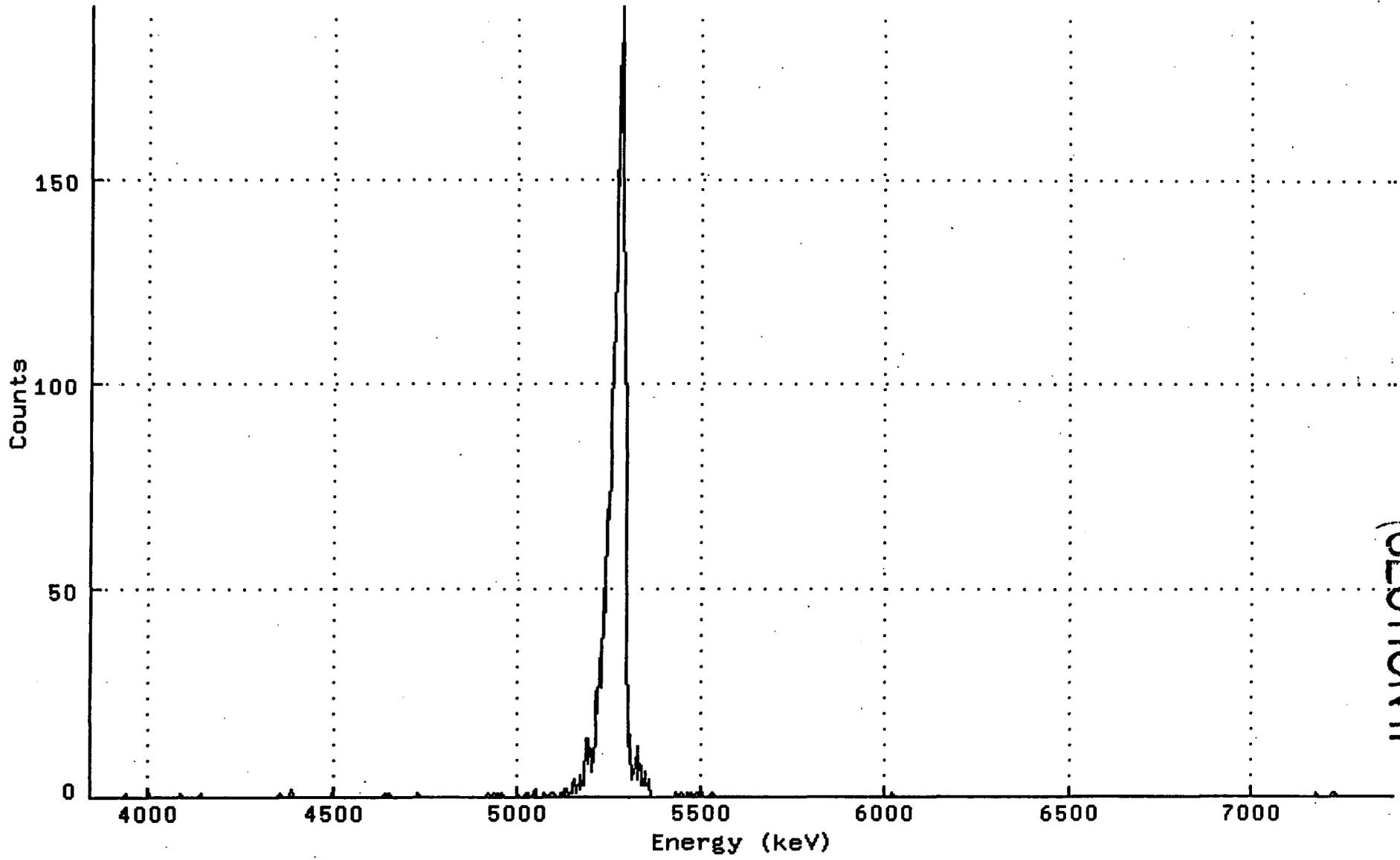
75

Spectrum : WIZARD\$DKC200:[AHIGH.ACUSR.ARCHIVE.S]S_99126525\$263944_AM.CNF;1

Title : 040

Sample Title:

Start Time: 11-DEC-1999 10:22	Sample Time: 29-NOV-1999 00:00	Energy Offset: 3.83148E+03
Real Time : 0 22:13:21.00	Sample ID : 263944	Energy Slope : 3.46978E+00
Live Time : 0 22:13:21.00	Sample Type: AM	Energy Quad : 0.00000E+00



SECTION II

249

Spectral File: ND_AMS_ARCHIVE_S:S_99126525\$263931D_AM.CNF

```

BATCH ID:          99126525      *      SAMPLE ID:          263931D
SAMPLE DATE:       29-NOV-1999 00:00 *      ALIQUOT:             6.310E-02 SA
SAMPLE TITLE:      *      DETECTOR NUMBER:       041
ACQ DATE:          11-DEC-1999 10:23 *      AVERAGE EFFICIENCY:  23.1%
ELAPSED LIVE TIME: 80003.        *      RECOVERY:             73.12%
TRACER ID:         AM243_82-76-2 *      TRACER FWHM (kev):   31.92
LAMBDA VALUE:      100.          *      ROI TYPE:            MANUAL
CORRECTED TRACER DPM: 11.270     *      CONFIDENCE LEVEL:    4.65
SAMPLE MATRIX:     MISC          *      LLD CONSTANT:        2.71
ENERGY CAL DATE:   3-DEC-1999 07:05 *      EFF CAL DATE:        3-DEC-1999 07:05
BKG FILENAME:      B_041_3DEC99  *

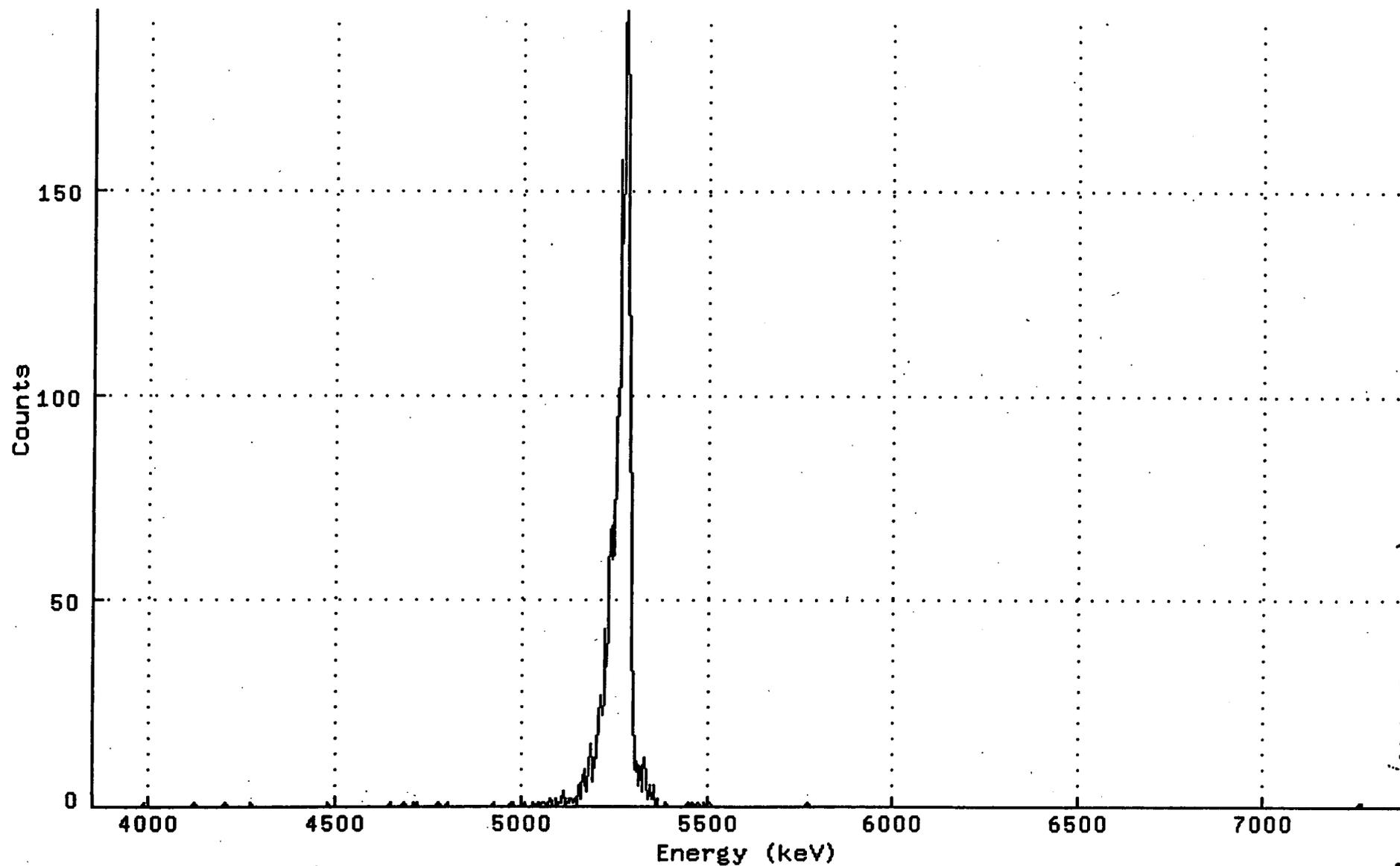
```

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/SA	TPU/ERROR 2-SIGMA	MDC dpm/SA	CRIT LEVEL SA
AM-241	5479.1	5.60	0.40	99.9	3.948E-01	3.506E-01	3.984E-01	2.947E-01
AM243	5270.0	2525.60	2.40	99.6	1.786E+02	8.462E+00	7.011E-01	4.464E-01

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.067 ***

Spectrum : WIZARD\$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99126525\$263931D_AM.CNF; 2
Title : 041
Sample Title:
Start Time: 11-DEC-1999 10:23 Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.83753E+03
Real Time : 0 22:13:23.00 Sample ID : 263931D Energy Slope : 3.45395E+00
Live Time : 0 22:13:23.00 Sample Type: AM Energy Quad : 0.00000E+00



(SECTION II)

79

251

SECTION II

Spectral File: ND_AMS_ARCHIVE_C:C_99126525\$LCSWR33_AM.CNF

```

*
BATCH ID:          99126525      *      SAMPLE ID:          LCSWR33
SAMPLE DATE:       1-APR-1985 00:00 *      ALIQUOT:           2.500E-01 mL
SAMPLE TITLE:      *      DETECTOR NUMBER:      042
ACQ DATE:          11-DEC-1999 10:23 *      AVERAGE EFFICIENCY: 23.6%
ELAPSED LIVE TIME: 80002.        *      RECOVERY:           75.07%
TRACER ID:         AM243_82-76-2 *      TRACER FWHM (kev):  36.33
LAMBDA VALUE:      100.          *      ROI TYPE:           MANUAL
CORRECTED TRACER DPM: 11.269     *      CONFIDENCE LEVEL:   4.65
SAMPLE MATRIX:     MISC          *      LLD CONSTANT:       2.71
ENERGY CAL DATE:   3-DEC-1999 07:08 *      EFF CAL DATE:       3-DEC-1999 07:08
BKG FILENAME:      B_042_3DEC99  *
*

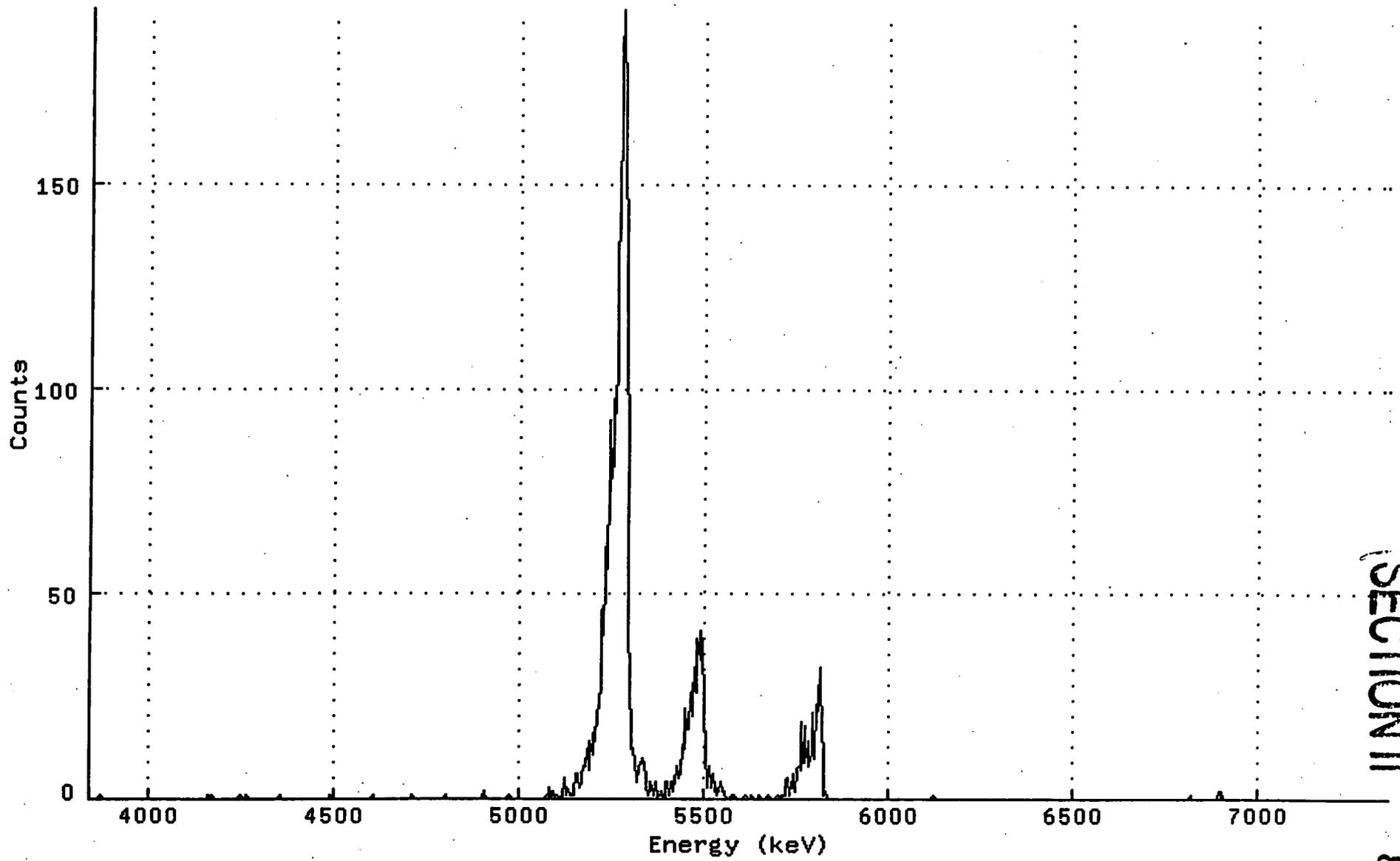
```

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY pCi/ mL	TPU/ERROR 2-SIGMA	MDC pCi/ mL	CRIT LEVEL pCi/ mL
AM-241	5479.1	584.80	1.20	99.9	4.574E+00	4.501E-01	5.962E-02	4.016E-02
AM243	5270.0	2645.80	1.20	99.6	2.031E+01	9.456E-01	5.981E-02	4.029E-02

*** POSITIVE ***

Spectrum : WIZARD\$DKC200:[AHIGH.ALUSR.ARCHIVE.C]C_99126525\$LCSWR33_AM.CNF; 2
Title : 042
Sample Title:
Start Time: 11-DEC-1999 10:23 Sample Time: 1-APR-1985 00:00: Energy Offset: 3.83215E+03
Real Time : 0 22:13:22.00 Sample ID : LCSWR33 Energy Slope : 3.43781E+00
Live Time : 0 22:13:22.00 Sample Type: AM Energy Quad : 0.00000E+00



SECTION II

81

253

Sample Preparation and Analysis Log

SECTION II

Sample Type: Various Solids

Method	Isotopes	Worklist Names	Chemist	Date
Digestion & Purification	RC-19 R06	Am-241		12/15/99
		Pu-239/240, Pu-238		
Counting	RC-19 R06	Am ²⁴¹		12/20/99

Tracers (Internal Standards)

isotope	ID	Conc(pCi/mL) @ RD	Aliquot(mL)	HL (years)	Activity(dpm)	Activity(pCi)
Pu-242	82-76-1	41.60	12/18/89	0.100	3.758E+05	9.24
Am-243	82-76-2	50.80	12/15/92	0.100	7380	11.27

Req	Sample ID	#	Aliquot Size	Comments/ Analysis	Sample Aliquot	Detector Number	Tare Weight(g)	Sample & Container(g)	Total Sample Size (g)
	PB	1	1 SA	Pu, Am		33			
16848	263922	2	0.500 G	Am	0.0460	34	14.561	25.425	10.864
16848	263923	3	0.500 G	Am	0.0420	35	14.565	26.476	11.911
16848	263924	4	0.500 G	Am	0.0320	37	14.692	30.302	15.610
16848	263922D	5	0.500 G	Am/Pu	0.0460	38	14.561	25.425	10.864
	LCSWR33	6	0.250 mL	Pu, Am		39			
	263930	7	0.500 G	Pu		40			
		8							
		9							
		10							
		11							
		12							
		13							
		14							
		15							
		16							
		17							
		18							
		19							
		20							
		21							
		22							
		23							
		24							
		25							
		26							
		27							
		28							
		29							
		30							

Comments and Actual conditions:

- Start date: 12/14/99
- Automatic pipets calibrated in accord with QC-6 on balance # 18
- Balance # 8 used for weights of samples and their aliquots
- Sample aliquot is the fraction of the total sample taken for analysis

Quidby 01/19/00
 S. Jantz 12/20/99
 12/30/99

Spectral File: ND_AMS_ARCHIVE_R:R_99126647\$PB_AM.CNF

```

*
BATCH ID:          99126647      *      SAMPLE ID:          PB
SAMPLE DATE:      29-NOV-1999 00:00 *      ALIQUOT:          1.000E+00 SA
SAMPLE TITLE:     *      DETECTOR NUMBER:      033
ACQ DATE:        16-DEC-1999 15:03 *      AVERAGE EFFICIENCY: 26.7%
ELAPSED LIVE TIME: 80002.        *      RECOVERY:          89.68%
TRACER ID:       AM243_82-76-2   *      TRACER FWHM (kev): 50.19
LAMBDA VALUE:    100.            *      ROI TYPE:         MANUAL
CORRECTED TRACER DPM: 11.270     *      CONFIDENCE LEVEL: 4.65
SAMPLE MATRIX:   MISC            *      LLD CONSTANT:     2.71
ENERGY CAL DATE: 3-DEC-1999 06:50 *      EFF CAL DATE:     3-DEC-1999 06:50
BKG FILENAME:    B_033_3DEC99   *
*

```

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/SA	TPU/ERROR 2-SIGMA	MDC dpm/SA	CRIT LEVEL dpm/SA
AM-241	5479.1	10.60	0.40	99.9	3.324E-02	2.101E-02	1.772E-02	1.311E-02
AM243	5270.0	3583.00	4.00	99.6	1.127E+01	4.723E-01	3.778E-02	2.315E-02

*** POSITIVE ***

Spectrum : WIZARD\$DKC200: [AHIGH.ALUSR.ARCHIVE.R]R_99126647\$PB_AM.CNF;1

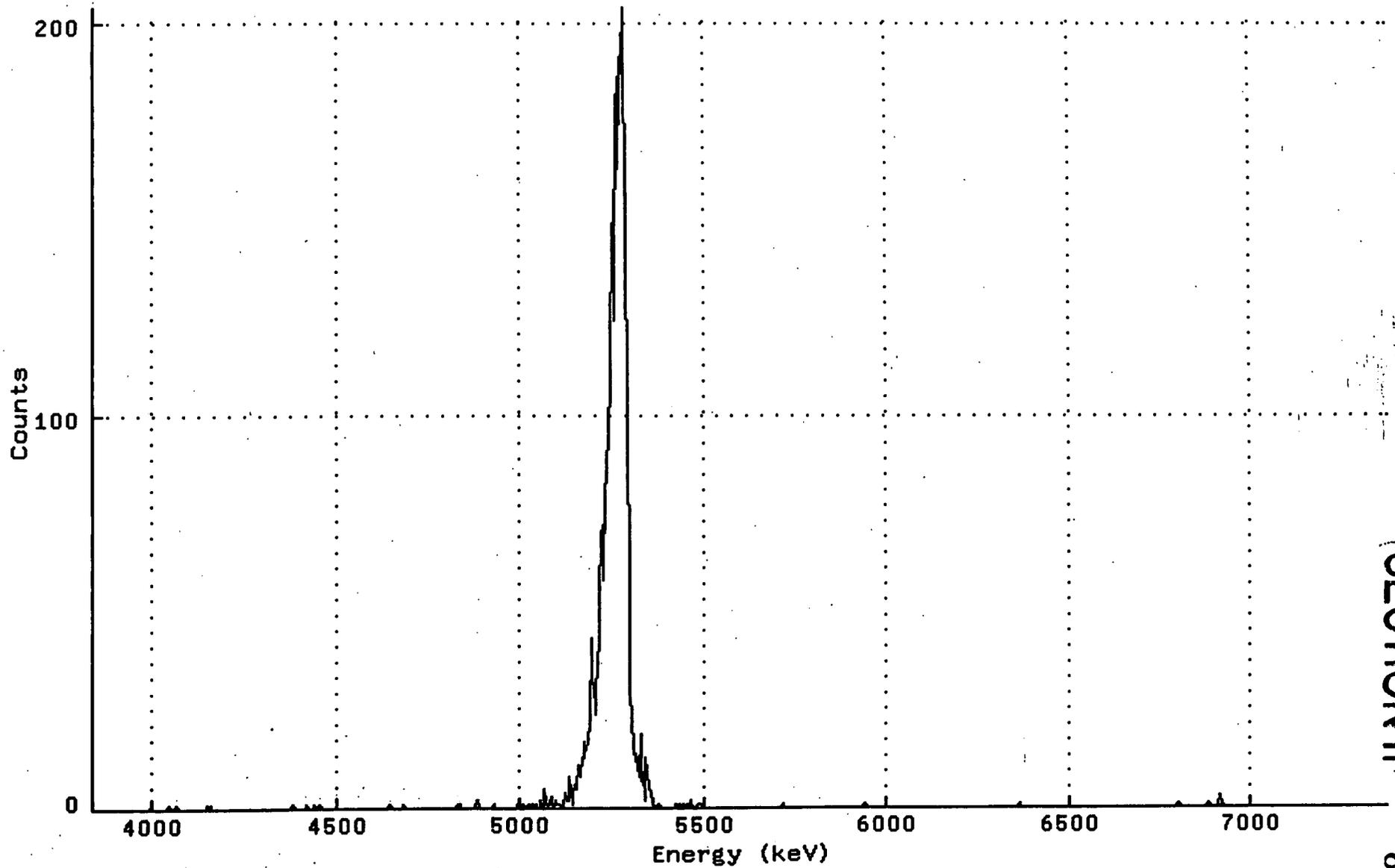
Title : 033

Sample Title:

Start Time: 16-DEC-1999 15:03 Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.82871E+03

Real Time : 0 22:13:23.00 Sample ID : PB Energy Slope : 3.45977E+00

Live Time : 0 22:13:22.00 Sample Type: AM Energy Quad : 0.00000E+00



SECTION II

84

256

Spectral File: ND_AMS_ARCHIVE_S:S_99126647\$263922_AM.CNF

```

*
BATCH ID:          99126647      *      SAMPLE ID:          263922
SAMPLE DATE:      29-NOV-1999 00:00 *      ALIQUOT:          4.600E-02 SA
SAMPLE TITLE:     *      DETECTOR NUMBER:      034
ACQ DATE:        16-DEC-1999 15:04 *      AVERAGE EFFICIENCY: 22.1%
ELAPSED LIVE TIME: 80001.        *      RECOVERY:          69.45%
TRACER ID:       AM243_82-76-2   *      TRACER FWHM (kev): 61.44
LAMBDA VALUE:    100.            *      ROI TYPE:         MANUAL
CORRECTED TRACER DPM: 11.270     *      CONFIDENCE LEVEL: 4.65
SAMPLE MATRIX:   MISC           *      LLD CONSTANT:     2.71
ENERGY CAL DATE: 3-DEC-1999 06:51 *      EFF CAL DATE:     3-DEC-1999 06:51
BKG FILENAME:    B_034_3DEC99   *
*

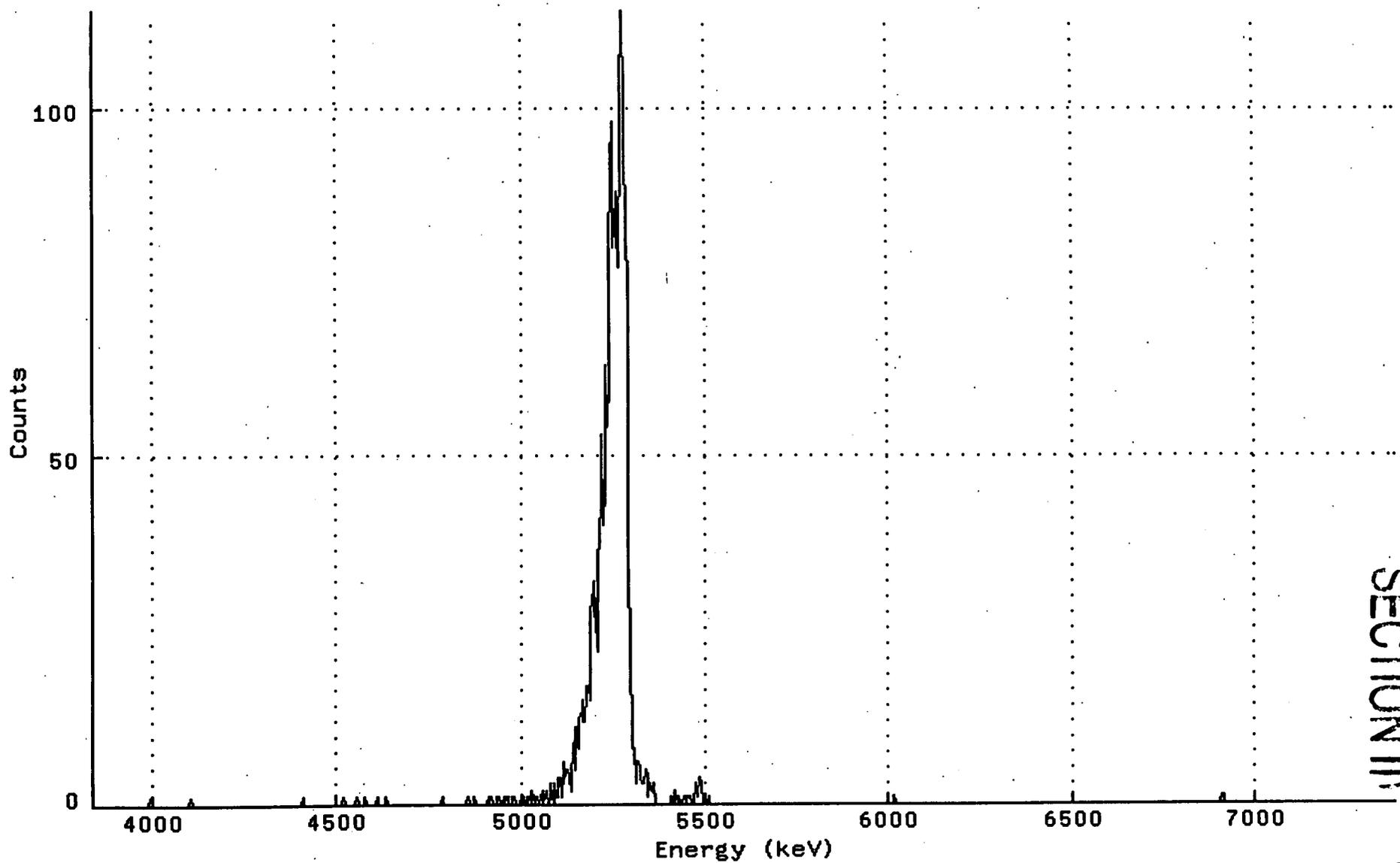
```

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/SA	TPU/ERROR 2-SIGMA	MDC dpm/SA	CRIT LEVEL dpm/SA
AM-241	5479.1	28.20	0.80	99.9	2.994E+00	1.162E+00	7.293E-01	5.085E-01
AM243	5270.0	2300.40	3.60	99.6	2.450E+02	1.202E+01	1.228E+00	7.585E-01

** POSITIVE **
** RECOUNT SAMPLE CL > 0.067 **

Spectrum : WIZARD\$DKC200: [AHIGH.ALUSR.ARCHIVE.S]S_99126647\$263922_AM.CNF; 1
Title : 034
Sample Title:
Start Time: 16-DEC-1999 15:04 Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.82875E+03
Real Time : 0 22:13:21.00 Sample ID : 263922 Energy Slope : 3.46609E+00
Live Time : 0 22:13:21.00 Sample Type: AM Energy Quad : 0.00000E+00



SECTION II

258



Spectral File: ND_AMS_ARCHIVE_S:S_99126647\$263923_AM.CNF

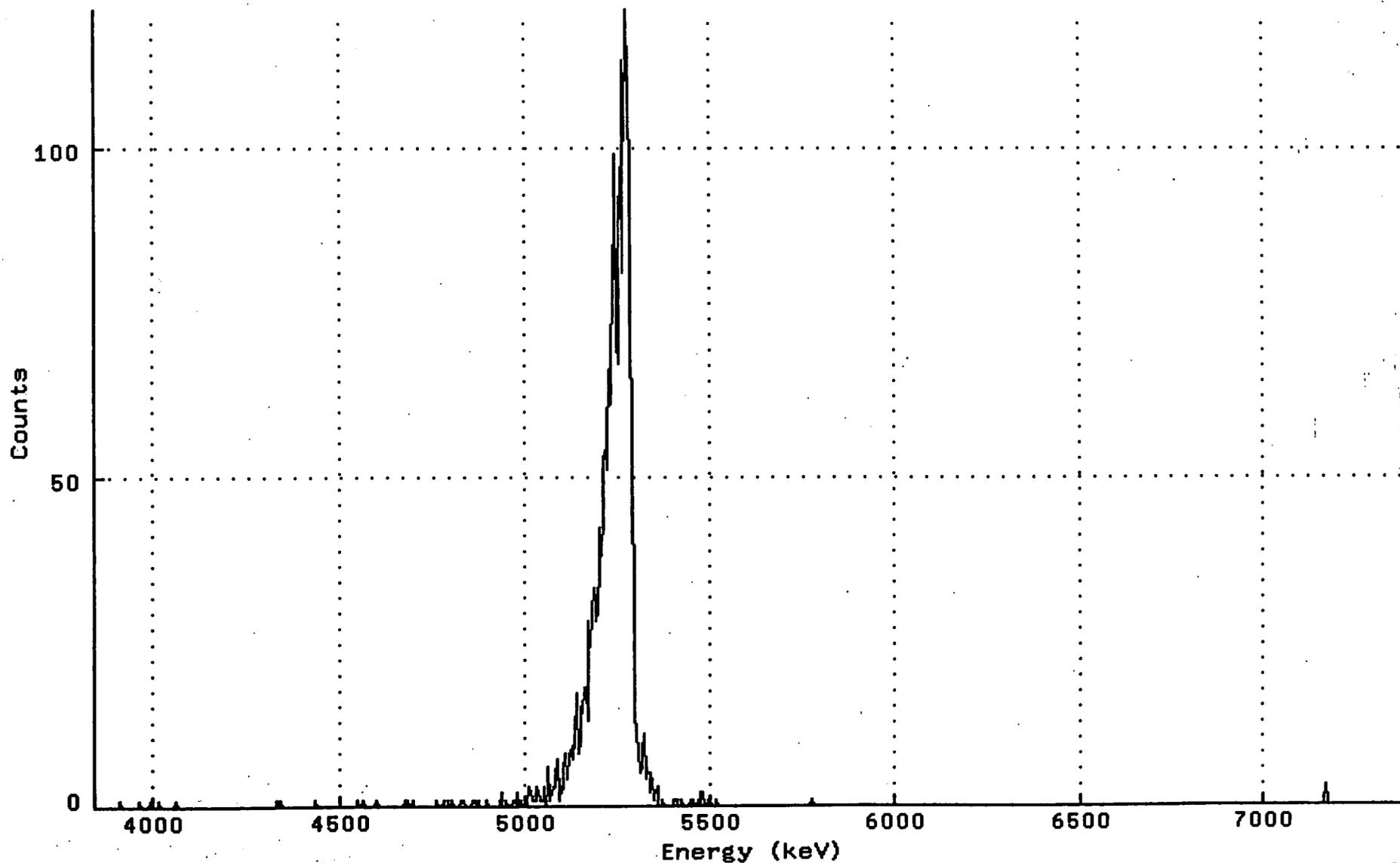
BATCH ID:	99126647	*	SAMPLE ID:	263923
SAMPLE DATE:	29-NOV-1999 00:00	*	ALIQOT:	4.200E-02 SA
SAMPLE TITLE:		*	DETECTOR NUMBER:	035
ACQ DATE:	16-DEC-1999 15:04	*	AVERAGE EFFICIENCY:	26.3%
ELAPSED LIVE TIME:	80003.	*	RECOVERY:	66.84%
TRACER ID:	AM243_82-76-2	*	TRACER FWHM (kev):	62.95
LAMBDA VALUE:	100.	*	ROI TYPE:	MANUAL
CORRECTED TRACER DPM:	11.270	*	CONFIDENCE LEVEL:	4.65
SAMPLE MATRIX:	MISC	*	LLD CONSTANT:	2.71
ENERGY CAL DATE:	3-DEC-1999 06:53	*	EFF CAL DATE:	3-DEC-1999 06:53
BKG FILENAME:	B_035_3DEC99	*		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/SA	TPU/ERROR 2-SIGMA	MDC dpm/SA	CRIT LEVEL dpm/SA
AM-241	5479.1	9.00	0.00	99.9	9.144E-01	6.115E-01	2.753E-01	2.753E-01
AM243	5270.0	2633.00	2.00	99.6	2.683E+02	1.248E+01	9.464E-01	6.113E-01

** POSITIVE **
** RECOUNT SAMPLE CL > 0.067 **

Spectrum : WIZARD\$DKC200: [AHIGH.ALUSR.ARCHIVE.S]S_99126647\$263923_AM.CNF; 1
Title : 035
Sample Title:
Start Time: 16-DEC-1999 15:04 Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.83117E+03
Real Time : 0 22:13:23.00 Sample ID : 263923 Energy Slope : 3.47159E+00
Live Time : 0 22:13:23.00 Sample Type: AM Energy Quad : 0.00000E+00



260

SECTION III

88

Spectral File: ND_AMS_ARCHIVE_S:S_99126647\$263924_AM.CNF

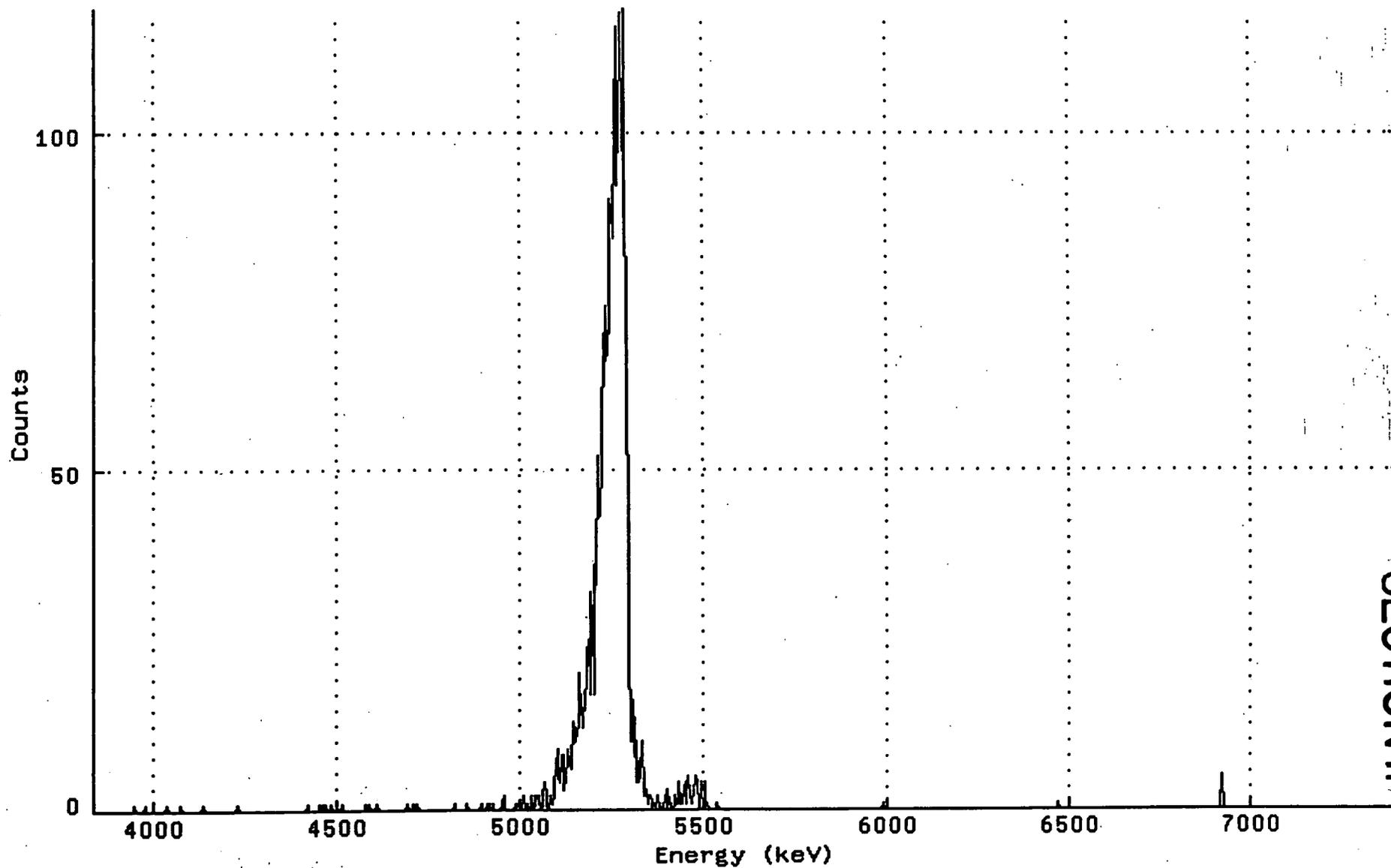
BATCH ID:	99126647	*	SAMPLE ID:	263924
SAMPLE DATE:	29-NOV-1999 00:00	*	ALIQUOT:	3.200E-02 SA
SAMPLE TITLE:		*	DETECTOR NUMBER:	037
ACQ DATE:	16-DEC-1999 15:04	*	AVERAGE EFFICIENCY:	23.1%
ELAPSED LIVE TIME:	80000.	*	RECOVERY:	74.40%
TRACER ID:	AM243_82-76-2	•	TRACER FWHM (kev):	65.80
LAMBDA VALUE:	100.	•	ROI TYPE:	MANUAL
CORRECTED TRACER DPM:	11.270	*	CONFIDENCE LEVEL:	4.65
SAMPLE MATRIX:	MISC	*	LLD CONSTANT:	2.71
ENERGY CAL DATE:	3-DEC-1999 06:56	*	EFF CAL DATE:	3-DEC-1999 06:56
BKG FILENAME:	B_037_3DEC99	*		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/SA	TPU/ERROR 2-SIGMA	MDC dpm/SA	CRIT LEVEL dpm/SA
AM-241	5479.1	66.00	0.00	99.9	9.008E+00	2.269E+00	3.698E-01	3.698E-01
AM243	5270.0	2572.40	1.60	99.6	3.522E+02	1.654E+01	1.176E+00	7.737E-01

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.067 ***

Spectrum : WIZARD\$DKC200: [AHIGH.ALUSR.ARCHIVE.S]S_99126647\$263924_AM.CNF; 1
Title : 037
Sample Title:
Start Time: 16-DEC-1999 15:04 Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.82918E+03
Real Time : 0 22:13:20.00 Sample ID : 263924 Energy Slope : 3.47146E+00
Live Time : 0 22:13:20.00 Sample Type: AM Energy Quad : 0.00000E+00



SECTION III

90

262

Spectral File: ND_AMS_ARCHIVE S:S_99126647\$263922D_AM.CNF

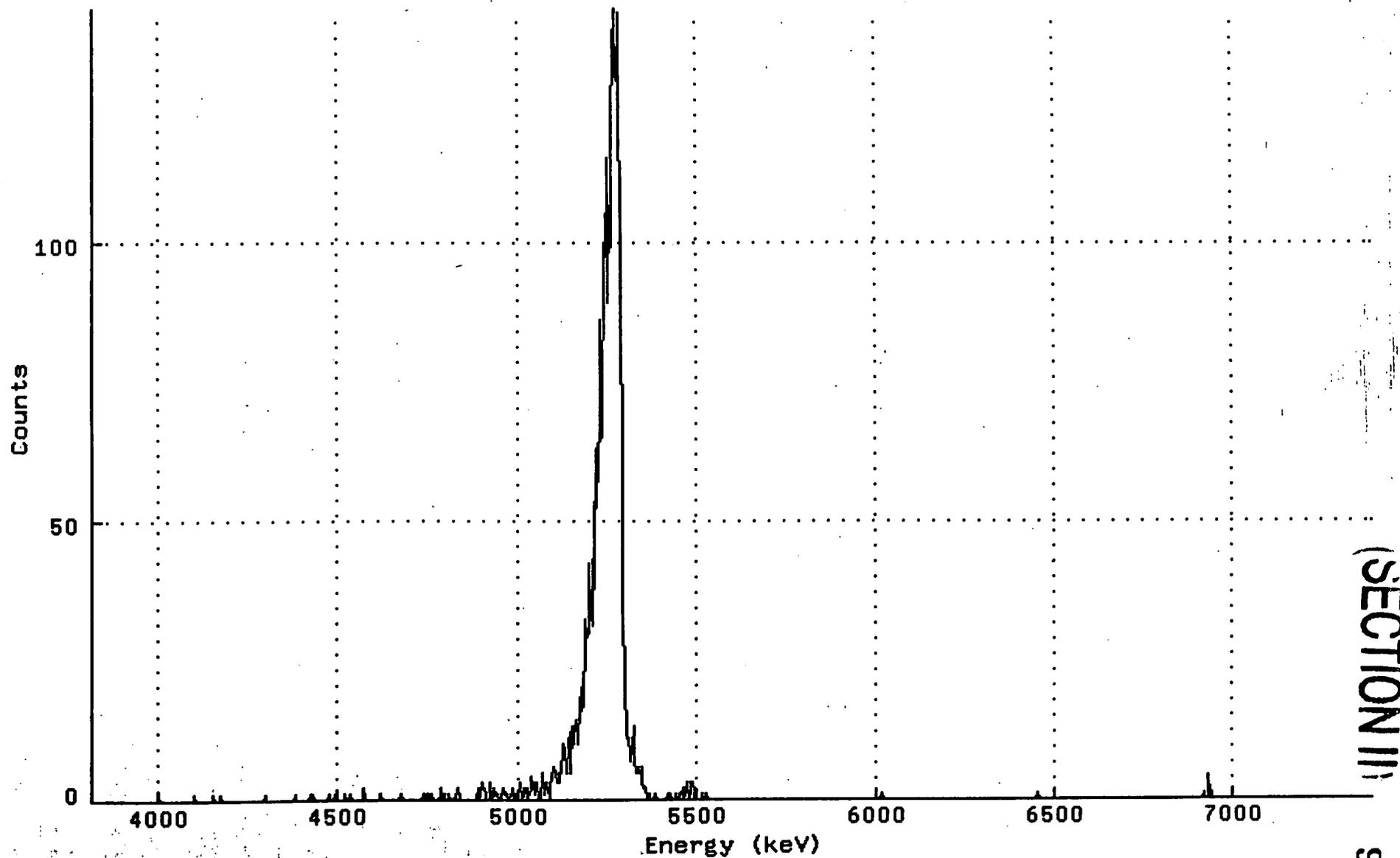
```
*****
BATCH ID:          99126647      *      SAMPLE ID:          263922D
SAMPLE DATE:      29-NOV-1999 00:00 *      ALIQUOT:          4.600E-02 SA
SAMPLE TITLE:    *      DETECTOR NUMBER:          038
ACQ DATE:        16-DEC-1999 15:04 *      AVERAGE EFFICIENCY:          23.3%
ELAPSED LIVE TIME: 80002.      *      RECOVERY:          83.67%
TRACER ID:       AM243_82-76-2 *      TRACER FWHM (kev):          60.67
LAMBDA VALUE:    100.          *      ROI TYPE:          MANUAL
CORRECTED TRACER DPM: 11.270   *      CONFIDENCE LEVEL:          4.65
SAMPLE MATRIX:   MISC          *      LLD CONSTANT:          2.71
ENERGY CAL DATE: 3-DEC-1999 06:57 *      EFF CAL DATE:          3-DEC-1999 06:57
BKG FILENAME:    B_038_3DEC99 *
*****
```

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/SA	TPU/ERROR 2-SIGMA	MDC dpm/SA	CRIT LEVEL dpm/SA
AM-241	5479.1	24.00	0.00	99.9	2.013E+00	8.283E-01	2.272E-01	2.272E-01
AM243	5270.0	2912.40	1.60	99.6	2.450E+02	1.103E+01	7.228E-01	4.754E-01

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.067 ***

Spectrum : WIZARD\$DKC200: [AHIGH.ALUSR.ARCHIVE.S]S_99126647\$263922D_AM.CNF; 1
Title : 038
Sample Title:
Start Time: 16-DEC-1999 15:04 Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.80868E+03
Real Time : 0 22:13:22.00 Sample ID : 263922D Energy Slope : 3.49666E+00
Live Time : 0 22:13:22.00 Sample Type: AM Energy Quad : 0.00000E+00



264

Spectral File: ND_AMS_ARCHIVE_C:C_99126647\$LCSWR33_AM.CNF

```

*
BATCH ID:          99126647      *      SAMPLE ID:          LCSWR33
SAMPLE DATE:       1-APR-1985 00:00 *      ALIQUOT:           2.500E-01 mL
SAMPLE TITLE:      *      DETECTOR NUMBER:      039
ACQ DATE:          16-DEC-1999 15:04 *      AVERAGE EFFICIENCY: 23.3%
ELAPSED LIVE TIME: 80001.        *      RECOVERY:           82.78%
TRACER ID:         AM243_82-76-2 *      TRACER FWHM (kev):   75.49
LAMBDA VALUE:      100.          *      ROI TYPE:           MANUAL
CORRECTED TRACER DPM: 11.269     *      CONFIDENCE LEVEL:   4.65
SAMPLE MATRIX:     MISC          *      LLD CONSTANT:       2.71
ENERGY CAL DATE:   3-DEC-1999 06:59 *      EFF CAL DATE:       3-DEC-1999 06:59
BKG FILENAME:      B_039_3DEC99  *
*

```

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY pCi/ mL	TPU/ERROR 2-SIGMA	MDC pCi/ mL	CRIT LEVEL pCi/ mL
AM-241	5479.1	659.20	0.80	99.9	4.724E+00	4.427E-01	4.808E-02	3.353E-02
AM243	5270.0	2887.60	4.40	99.6	2.031E+01	9.183E-01	8.752E-02	5.328E-02

*** POSITIVE ***

Spectrum : WIZARD\$DKC200: [AHIGH.ALUSR.ARCHIVE.C]C_99126647\$LCSWR33_AM.CNF; 1

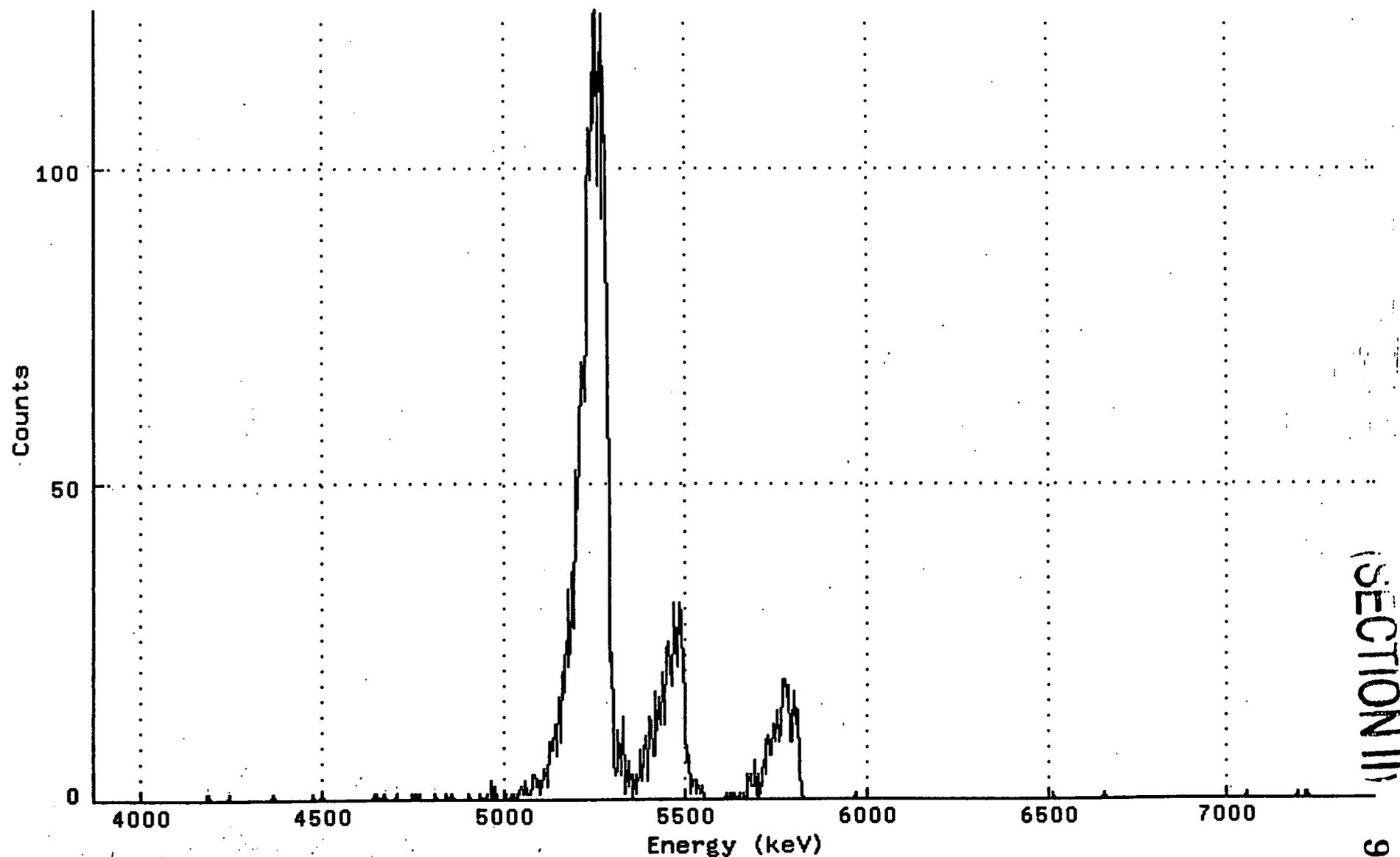
Title : 039

Sample Title:

Start Time: 16-DEC-1999 15:04 Sample Time: 1-APR-1985 00:00: Energy Offset: 3.86215E+03

Real Time : 0 22:13:21.00 Sample ID : LCSWR33 Energy Slope : 3.45693E+00

Live Time : 0 22:13:21.00 Sample Type: AM Energy Quad : 0.00000E+00



(SECTION III)

94

266

Sample Preparation and Analysis Log

(SECTION II)

Sample Type: Various Solids

Method	Isotopes	Worklist Names	Chemist	Date
Digestion & Purification	RC-19 R06	Am-241	99126522	
		Pu-239/240, Pu-238	99126523	
		U-238, U235, U234	99126524	
Counting	RC-19 R06	Pu^{150}	99126523	

Tracers (Internal Standards)

Isotope	ID	Conc(pCi/mL) @ RD	Aliquot(mL)	HL (years)	Activity(dpm)	Activity(pCi)
232	178-06-3	50.91 12/15/92	0.100	72	10.57	4.76
Am-243	82-76-2	50.80 12/15/92	0.100	7380	11.27	5.08
Pu-242	82-76-1	41.60 12/18/89	0.100	3.758E+05	9.24	4.16

Req	Sample ID	#	Aliquot Size	Comments/ Analysis	Sample Aliquot	Detector Number	Tare Weight(g)	Sample & Container(g)	Total Sample Size (g)
	PB	1	1 SA			33			
16848	263829	2	0.500 G			34			
6848	263830	3	0.500 G	*		35			
6848	263831	4	0.500 G			36			
16848	263832	5	0.500 G			37			
16848	263921	6	0.500 G		0.0393	38	14.704	27.413	12.709
6848	263922	7	0.500 G		0.0460	39	14.561	25.425	10.864
16848	263923	8	0.500 G		0.0420	40	14.565	26.476	11.911
16848	263924	9	0.500 G		0.0320	41	14.692	30.302	15.610
6848	263925	10	0.500 G		0.0305	42	14.552	30.939	16.387
6848	263926	11	0.500 G		0.0494	43	14.543	24.660	10.117
16848	263927	12	0.500 G		0.0550	44	14.559	23.646	9.087
6848	263928	13	0.500 G		0.0353	45	14.696	28.843	14.147
6848	263929	14	0.500 G		0.0285	46	14.467	32.032	17.565
16848	263930	15	0.500 G		0.0488	47	14.458	24.708	10.250
16848	263921D	16	0.500 G		0.0393	48	14.704	27.413	12.709
	CSWR1, LCSWR33	17	0.250 mL			33			
		18							
		19							
		20							
		21							
		22							
		23							
		24							
		25							
		26							
		27							
		28							
		29							
		30							

Comments and Actual conditions:

-Start date: 12/1/99
 -Automatic pipets calibrated in accord with QC-6 on balance # 18
 -Balance # 8 used for weights of samples and their aliquots
 -Sample aliquot is the fraction of the total sample taken for analysis
 * Chemical recovery < 30% sample to be reanalyzed.

Qidby
S. Spate
 12/15/99
 OK 10
 12/14/99

Spectral File: ND_AMS_ARCHIVE_R:R_99126523\$PB_PU.CNF

```

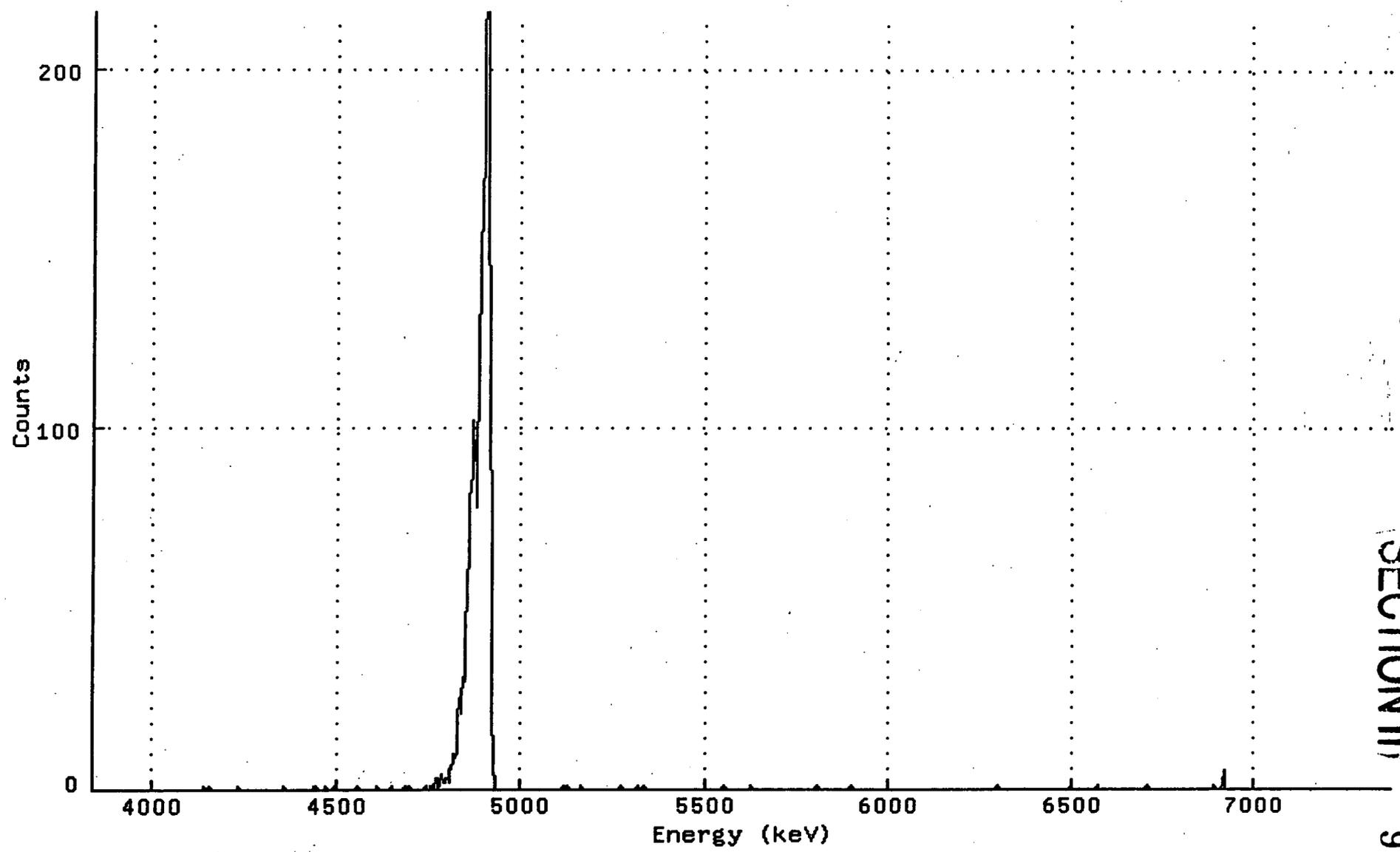
*
BATCH ID:          99126523      *
SAMPLE DATE:      29-NOV-1999 00:00 *
SAMPLE TITLE:     *
ACQ DATE:         7-DEC-1999 10:17 *
ELAPSED LIVE TIME: 80001.        *
TRACER ID:        PU242_82-76-1  *
LAMBDA VALUE:     100.           *
CORRECTED TRACER DPM: 9.235      *
SAMPLE MATRIX:    MISC           *
ENERGY CAL DATE:  3-DEC-1999 06:50 *
BKG FILENAME:     B_033_3DEC99   *
*
SAMPLE ID:          *
ALIQUOT:            1.000E+00     *
DETECTOR NUMBER:   033           *
AVERAGE EFFICIENCY: 26.7%       *
RECOVERY:          84.69%        *
TRACER FWHM (kev): 32.02         *
ROI TYPE:          STANDARD       *
CONFIDENCE LEVEL:  4.65          *
LLD CONSTANT:     2.71           *
EFF CAL DATE:     3-DEC-1999 06:50 *
*

```

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/SA	TPU/ERROR 2-SIGMA	MDC dpm/SA	CRIT LEVEL dpm/SA
PU-238	5487.1	0.20	0.80	99.9	6.645E-04	7.633E-03	2.281E-02	1.591E-02
PU-239	5147.7	1.40	1.60	99.9	4.650E-03	1.268E-02	2.854E-02	1.877E-02
PU242	4890.7	2794.40	1.60	100.4	9.235E+00	4.202E-01	2.839E-02	1.868E-02

Spectrum : WIZARD\$DKC200:[AHIGH.ALUSR.ARCHIVE.R]R_99126523\$PB_PU.CNF;3
Title : 033
Sample Title:
Start Time: 7-DEC-1999 10:17: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.82871E+03
Real Time : 0 22:13:21.00 Sample ID : PB Energy Slope : 3.45977E+00
Live Time : 0 22:13:21.00 Sample Type: PU Energy Quad : 0.00000E+00



SECTION III

269

 Spectral File: ND_AMS_ARCHIVE_S:S_99126523\$263829_PU.CNF

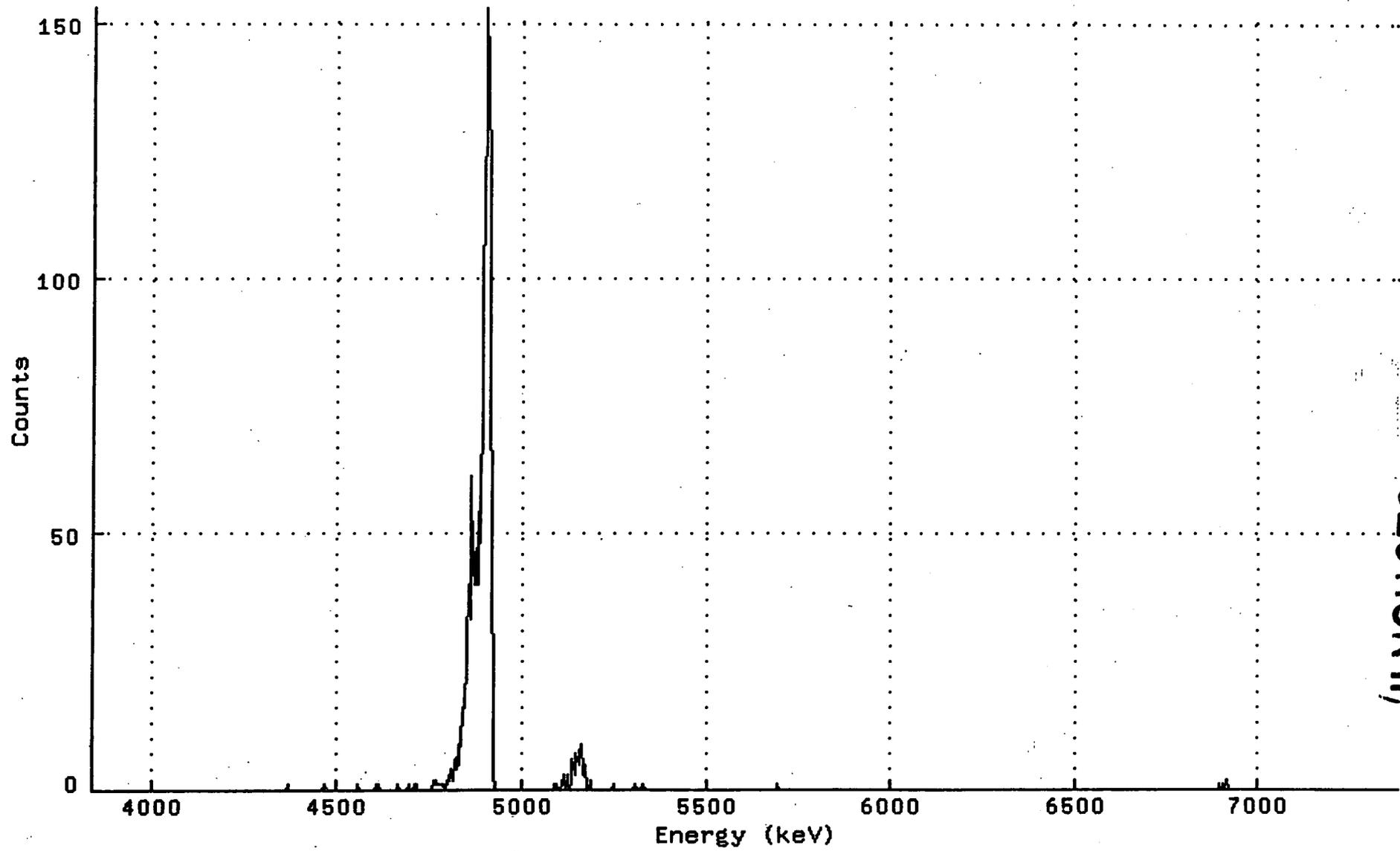
BATCH ID:	99126523	*	SAMPLE ID:	263829
SAMPLE DATE:	29-NOV-1999 00:00	*	ALIQOT:	5.000E-01 g
SAMPLE TITLE:		*	DETECTOR NUMBER:	034
ACQ DATE:	7-DEC-1999 10:13	*	AVERAGE EFFICIENCY:	22.1%
ELAPSED LIVE TIME:	80005.	•	RECOVERY:	58.10%
TRACER ID:	PU242_82-76-1	*	TRACER FWHM (kev):	24.97
LAMBDA VALUE:	100.	•	ROI TYPE:	STANDARD
CORRECTED TRACER DPM:	9.235	*	CONFIDENCE LEVEL:	4.65
SAMPLE MATRIX:	MISC	*	LLD CONSTANT:	2.71
ENERGY CAL DATE:	3-DEC-1999 06:51	*	EFF CAL DATE:	3-DEC-1999 06:51
BKG FILENAME:	B_034_3DEC99	*		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY pCi/	TPU/ERROR g 2-SIGMA	MDC pCi/	CRIT LEVEL g pCi/
PU-238	5487.1	-0.80	0.80	99.9	-4.210E-03	5.960E-03	3.614E-02	2.520E-02
PU-239	5147.7	73.60	2.40	99.9	3.872E-01	9.539E-02	5.216E-02	3.321E-02
PU242	4890.7	1589.20	2.80	100.4	8.320E+00	4.697E-01	5.492E-02	3.456E-02

*** POSITIVE ***

Spectrum : WIZARD\$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99126523\$263829_PU.CNF; 3
Title : 034
Sample Title:
Start Time: 7-DEC-1999 10:13: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.82875E+03
Real Time : 0 22:13:25.00 Sample ID : 263829 Energy Slope : 3.46609E+00
Live Time : 0 22:13:25.00 Sample Type: PU Energy Quad : 0.00000E+00



SECTION II)

271

Spectral File: ND_AMS_ARCHIVE_S:S_99126523\$263831_PU.CNF

BATCH ID:	99126523	*	SAMPLE ID:	263831
SAMPLE DATE:	29-NOV-1999 00:00	*	ALIQOT:	5.000E-01 g
SAMPLE TITLE:		*	DETECTOR NUMBER:	036
ACQ DATE:	7-DEC-1999 10:14	*	AVERAGE EFFICIENCY:	23.6%
ELAPSED LIVE TIME:	80004.	*	RECOVERY:	75.53%
TRACER ID:	PU242_82-76-1	•	TRACER FWHM (kev):	29.18
LAMBDA VALUE:	100.	•	ROI TYPE:	STANDARD
CORRECTED TRACER DPM:	9.235	•	CONFIDENCE LEVEL:	4.65
SAMPLE MATRIX:	MISC	*	LLD CONSTANT:	2.71
ENERGY CAL DATE:	3-DEC-1999 06:55	*	EFF CAL DATE:	3-DEC-1999 06:55
BKG FILENAME:	B_036_3DEC99	*		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY pCi/	TPU/ERROR g 2-SIGMA	MDC pCi/	CRIT LEVEL g pCi/
PU-238	5487.1	2.60	0.40	99.9	9.848E-03	1.348E-02	2.140E-02	1.583E-02
PU-239	5147.7	3150.60	2.40	99.9	1.193E+01	7.908E-01	3.754E-02	2.390E-02
PU242	4890.7	2208.00	0.00	100.4	8.320E+00	4.132E-01	1.021E-02	1.021E-02

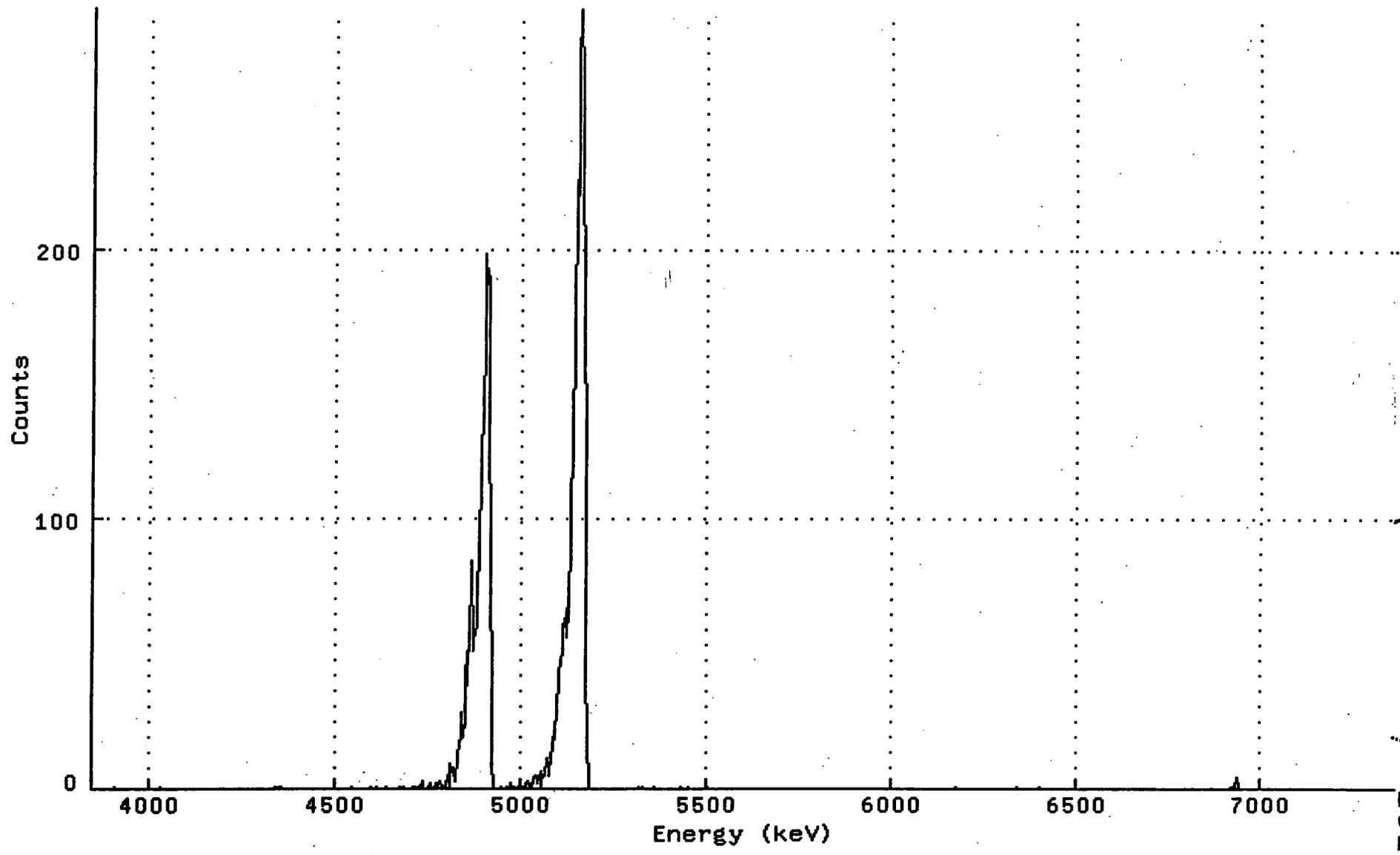
*** POSITIVE ***

Spectrum : WIZARD\$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99126523\$263831_PU.CNF;3

Title : 036

Sample Title:

Start Time: 7-DEC-1999 10:14:	Sample Time: 29-NOV-1999 00:00	Energy Offset: 3.83429E+03
Real Time : 0 22:13:24.00	Sample ID : 263831	Energy Slope : 3.44342E+00
Live Time : 0 22:13:24.00	Sample Type: PU	Energy Quad : 0.00000E+00



(SECTION II) 101

273

 Spectral File: ND_AMS_ARCHIVE_S:S_99126523\$263832_PU.CNF

BATCH ID:	99126523	*	SAMPLE ID:	263832
SAMPLE DATE:	29-NOV-1999 00:00	*	ALIQOT:	5.000E-01 g
SAMPLE TITLE:		*	DETECTOR NUMBER:	037
ACQ DATE:	7-DEC-1999 10:14	*	AVERAGE EFFICIENCY:	23.1%
ELAPSED LIVE TIME:	80004.	•	RECOVERY:	73.51%
TRACER ID:	PU242_82-76-1	*	TRACER FWHM (kev):	30.41
LAMBDA VALUE:	100.	•	ROI TYPE:	MANUAL
CORRECTED TRACER DPM:	9.235	*	CONFIDENCE LEVEL:	4.65
SAMPLE MATRIX:	MISC	*	LLD CONSTANT:	2.71
ENERGY CAL DATE:	3-DEC-1999 06:56	*	EFF CAL DATE:	3-DEC-1999 06:56
BKG FILENAME:	B_037_3DEC99	*		

 NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY pCi/	TPU/ERROR g 2-SIGMA	MDC pCi/	CRIT LEVEL g pCi/
PU-238	5487.1	1.00	0.00	99.9	3.984E-03	7.972E-03	1.080E-02	1.080E-02
PU-239	5147.7	1702.80	1.20	99.9	6.783E+00	5.058E-01	3.109E-02	2.094E-02
PU242	4890.7	2099.00	2.00	100.4	8.320E+00	4.208E-01	3.681E-02	2.377E-02

 *** POSITIVE ***

Spectrum : WIZARD\$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99126523\$263832_PU.CNF; 2

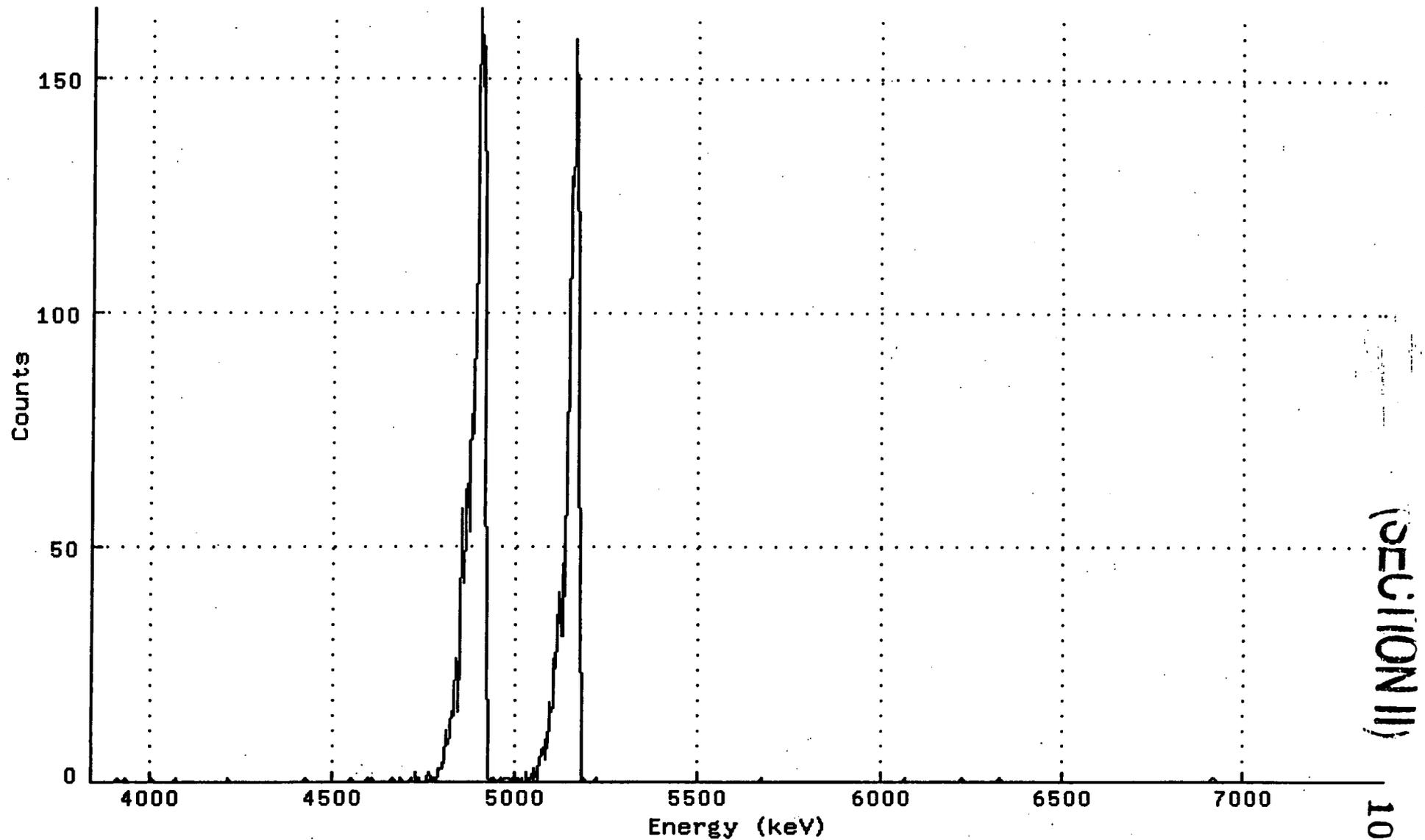
Title : 037

Sample Title:

Start Time: 7-DEC-1999 10:14: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.82918E+03

Real Time : 0 22:13:24.00 Sample ID : 263832 Energy Slope : 3.47146E+00

Live Time : 0 22:13:24.00 Sample Type: PU Energy Quad : 0.00000E+00



275

Spectral File: ND_AMS_ARCHIVE_S:S_99126523\$263921_PU.CNF

BATCH ID: 99126523 * SAMPLE ID: 263921
SAMPLE DATE: 29-NOV-1999 00:00 * ALIQUOT: 3.930E-02 SA
SAMPLE TITLE: * DETECTOR NUMBER: 038
ACQ DATE: 7-DEC-1999 10:14 * AVERAGE EFFICIENCY: 23.3%
ELAPSED LIVE TIME: 80002. * RECOVERY: 64.22%
TRACER ID: PU242_82-76-1 * TRACER FWHM (kev): 27.51
LAMBDA VALUE: 100. * ROI TYPE: STANDARD
CORRECTED TRACER DPM: 9.235 * CONFIDENCE LEVEL: 4.65
SAMPLE MATRIX: MISC * LLD CONSTANT: 2.71
ENERGY CAL DATE: 3-DEC-1999 06:57 * EFF CAL DATE: 3-DEC-1999 06:57
BKG FILENAME: B_038_3DEC99 *
●

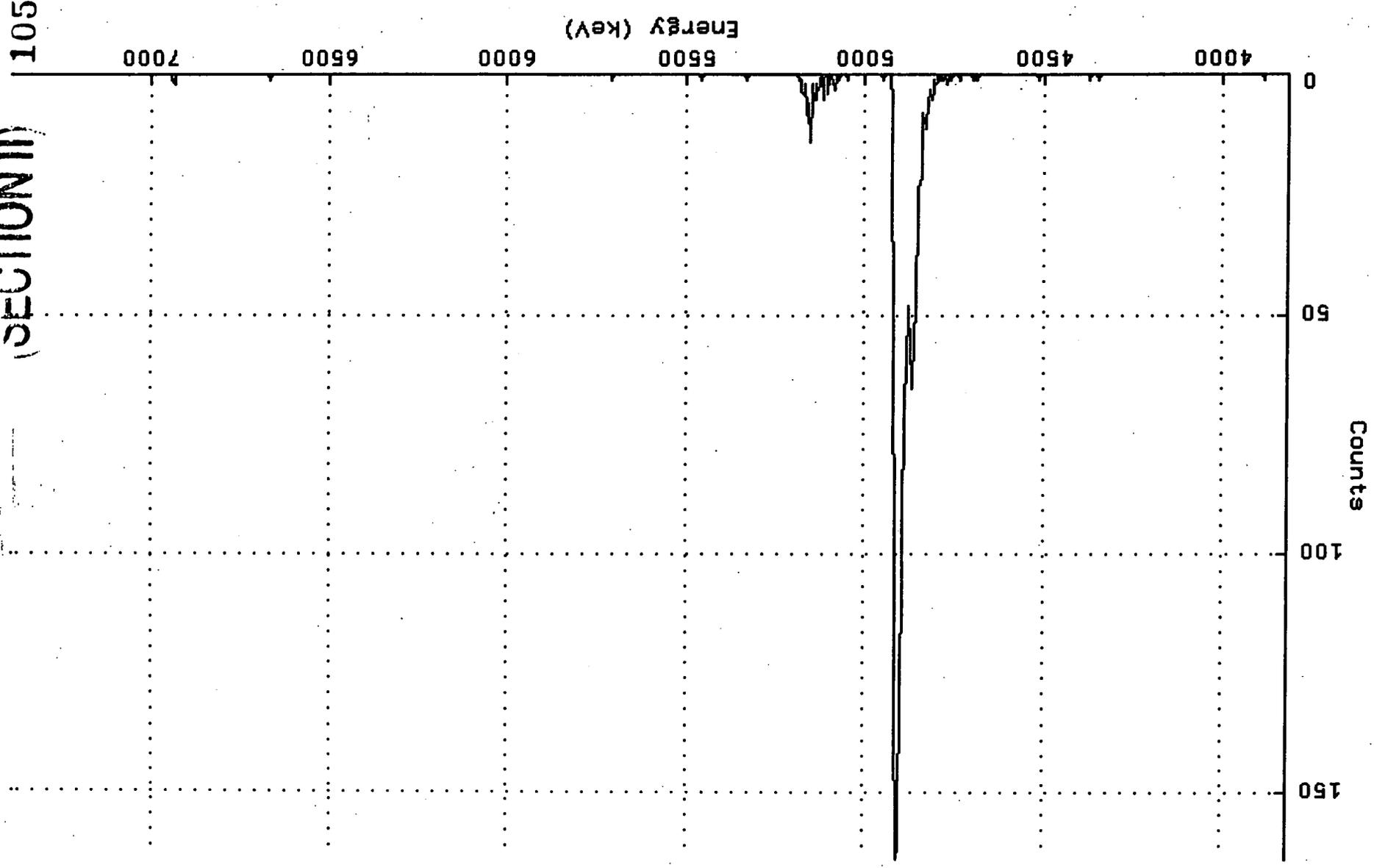
NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/SA	TPU/ERROR 2-SIGMA	MDC dpm/SA	CRIT LEVEL dpm/SA
PU-238	5487.1	1.00	0.00	99.9	1.280E-01	2.560E-01	3.467E-01	3.467E-01
PU-239	5147.7	93.60	0.40	99.9	1.197E+01	2.581E+00	7.229E-01	5.348E-01
PU242	4890.7	1846.00	0.00	100.4	2.350E+02	1.248E+01	3.450E-01	3.450E-01

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.067 ***

277

SECTION II



Spectrum : WIZARD\$DKC200: [AHTGH,ALUSR,ARCHIVE,S]S_99126523\$263921_PU.CNF;2
 Title : 038
 Sample Title:
 Start Time: 7-DEC-1999 10:14: Sample Time: 29-NOV-1999 00:00
 Real Time : 0 22:13:22.00 Sample ID : 263921
 Live Time : 0 22:13:22.00 Sample Type: PU
 Energy Offset: 3.80868E+03 Energy Quad : 0.00000E+00
 Energy Slope : 3.49666E+00

Spectral File: ND_AMS_ARCHIVE_S:S_99126523\$263922_PU.CNF

```
*****
BATCH ID:          99126523      *      SAMPLE ID:          263922
SAMPLE DATE:      29-NOV-1999 00:00 *      ALIQUOT:          4.600E-02 SA
SAMPLE TITLE:          *      DETECTOR NUMBER:      039
ACQ DATE:         7-DEC-1999 10:15 *      AVERAGE EFFICIENCY: 23.3%
ELAPSED LIVE TIME: 80001.        *      RECOVERY:          66.12%
TRACER ID:        PU242_82-76-1  *      TRACER FWHM (kev):  28.13
LAMBDA VALUE:     100.           *      ROI TYPE:          STANDARD
CORRECTED TRACER DPM: 9.235      *      CONFIDENCE LEVEL:  4.65
SAMPLE MATRIX:    MISC          *      LLD CONSTANT:      2.71
ENERGY CAL DATE:  3-DEC-1999 06:59 *      EFF CAL DATE:      3-DEC-1999 06:59
BKG FILENAME:     B_039_3DEC99  *
*****
```

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/	TPU/ERROR SA 2-SIGMA	MDC dpm/	CRIT LEVEL SA dpm/
PU-238	5487.1	21.20	0.80	99.9	2.243E+00	1.008E+00	7.266E-01	5.066E-01
PU-239	5147.7	1218.20	2.80	99.9	1.289E+02	1.055E+01	1.110E+00	6.982E-01
PU242	4890.7	1907.40	1.60	100.4	2.008E+02	1.054E+01	9.043E-01	5.948E-01

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.067 ***

Spectrum : WIZARD\$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99126523\$263922_PU.CNF; 2

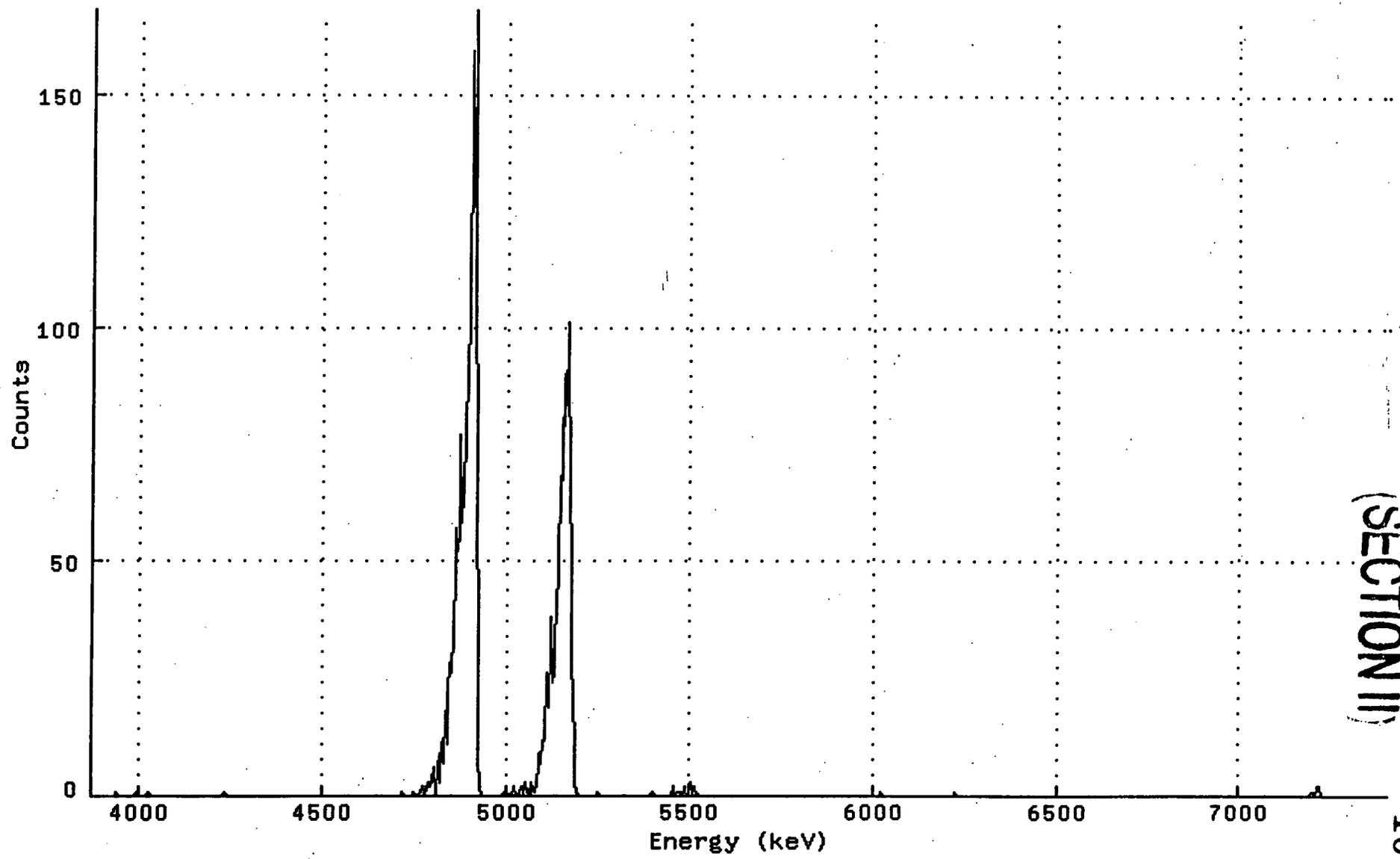
Title : 039

Sample Title:

Start Time: 7-DEC-1999 10:15: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.86215E+03

Real Time : 0 22:13:21.00 Sample ID : 263922 Energy Slope : 3.45693E+00

Live Time : 0 22:13:21.00 Sample Type: PU Energy Quad : 0.00000E+00



279

SECTION II

Spectral File: ND_AMS_ARCHIVE_S:S_99126523\$263923_PU.CNF

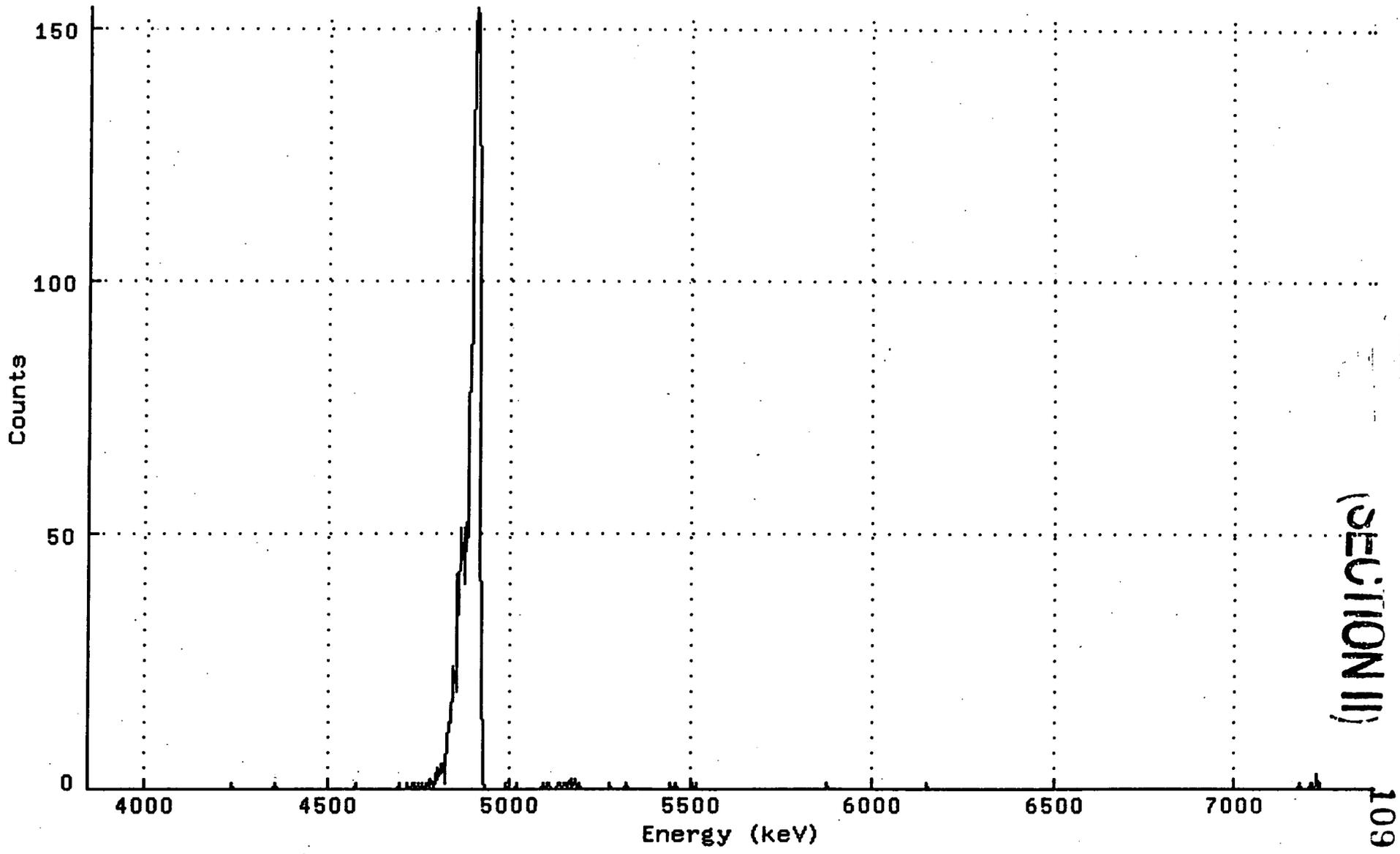
BATCH ID:	99126523	*	SAMPLE ID:	263923
SAMPLE DATE:	29-NOV-1999 00:00	•	ALIQOT:	4.200E-02 SA
SAMPLE TITLE:		*	DETECTOR NUMBER:	040
ACQ DATE:	7-DEC-1999 10:15	•	AVERAGE EFFICIENCY:	23.9%
ELAPSED LIVE TIME:	80003.	•	RECOVERY:	58.64%
TRACER ID:	PU242_82-76-1	*	TRACER FWHM (kev):	28.10
LAMBDA VALUE:	100.	*	ROI TYPE:	STANDARD
CORRECTED TRACER DPM:	9.235	•	CONFIDENCE LEVEL:	4.65
SAMPLE MATRIX:	MISC	*	LLD CONSTANT:	2.71
ENERGY CAL DATE:	3-DEC-1999 07:00	*	EFF CAL DATE:	3-DEC-1999 07:00
BKG FILENAME:	B_040_3DEC99	*		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/SA	TPU/ERROR 2-SIGMA	MDC dpm/SA	CRIT LEVEL dpm/SA
PU-238	5487.1	2.40	1.60	99.9	3.067E-01	5.508E-01	1.098E+00	7.219E-01
PU-239	5147.7	16.40	1.60	99.9	2.095E+00	1.110E+00	1.098E+00	7.219E-01
PU242	4890.7	1729.80	1.20	100.4	2.199E+02	1.199E+01	9.920E-01	6.682E-01

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.067 ***

Spectrum : WIZARD\$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99126523\$263923_PU.CNF; 2
Title : 040
Sample Title:
Start Time: 7-DEC-1999 10:15: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.83148E+03
Real Time : 0 22:13:23.00 Sample ID : 263923 Energy Slope : 3.46978E+00
Live Time : 0 22:13:23.00 Sample Type: PU Energy Quad : 0.00000E+00



28

 Spectral File: ND_AMS_ARCHIVE_S:S_99126523\$263924_PU.CNF

BATCH ID:	99126523	*	SAMPLE ID:	263924
SAMPLE DATE:	29-NOV-1999 00:00	•	ALIQUOT:	3.200E-02 SA
SAMPLE TITLE:		*	DETECTOR NUMBER:	041
ACQ DATE:	7-DEC-1999 10:15	*	AVERAGE EFFICIENCY:	23.1%
ELAPSED LIVE TIME:	80003.	*	RECOVERY:	72.56%
TRACER ID:	PU242_82-76-1	*	TRACER FWHM (kev):	29.70
LAMBDA VALUE:	100.	•	ROI TYPE:	STANDARD
CORRECTED TRACER DPM:	9.235	*	CONFIDENCE LEVEL:	4.65
SAMPLE MATRIX:	MISC	*	LLD CONSTANT:	2.71
ENERGY CAL DATE:	3-DEC-1999 07:05	*	EFF CAL DATE:	3-DEC-1999 07:05
BKG FILENAME:	B_041_3DEC99	*		

 NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/	TPU/ERROR SA 2-SIGMA	MDC dpm/	CRIT LEVEL SA dpm/
PU-238	5487.1	0.60	0.40	99.9	8.409E-02	3.019E-01	7.919E-01	5.858E-01
PU-239	5147.7	73.00	2.00	99.9	1.023E+01	2.509E+00	1.301E+00	8.405E-01
PU242	4890.7	2069.80	1.20	100.4	2.886E+02	1.470E+01	1.088E+00	7.330E-01

 *** POSITIVE ***
 *** RECOUNT SAMPLE CL > 0.067 ***

Spectrum : WIZARD\$DKC200: [AHIGH.ALUSR.ARCHIVE.S]S_99126523\$263924_PU.CNF; 2

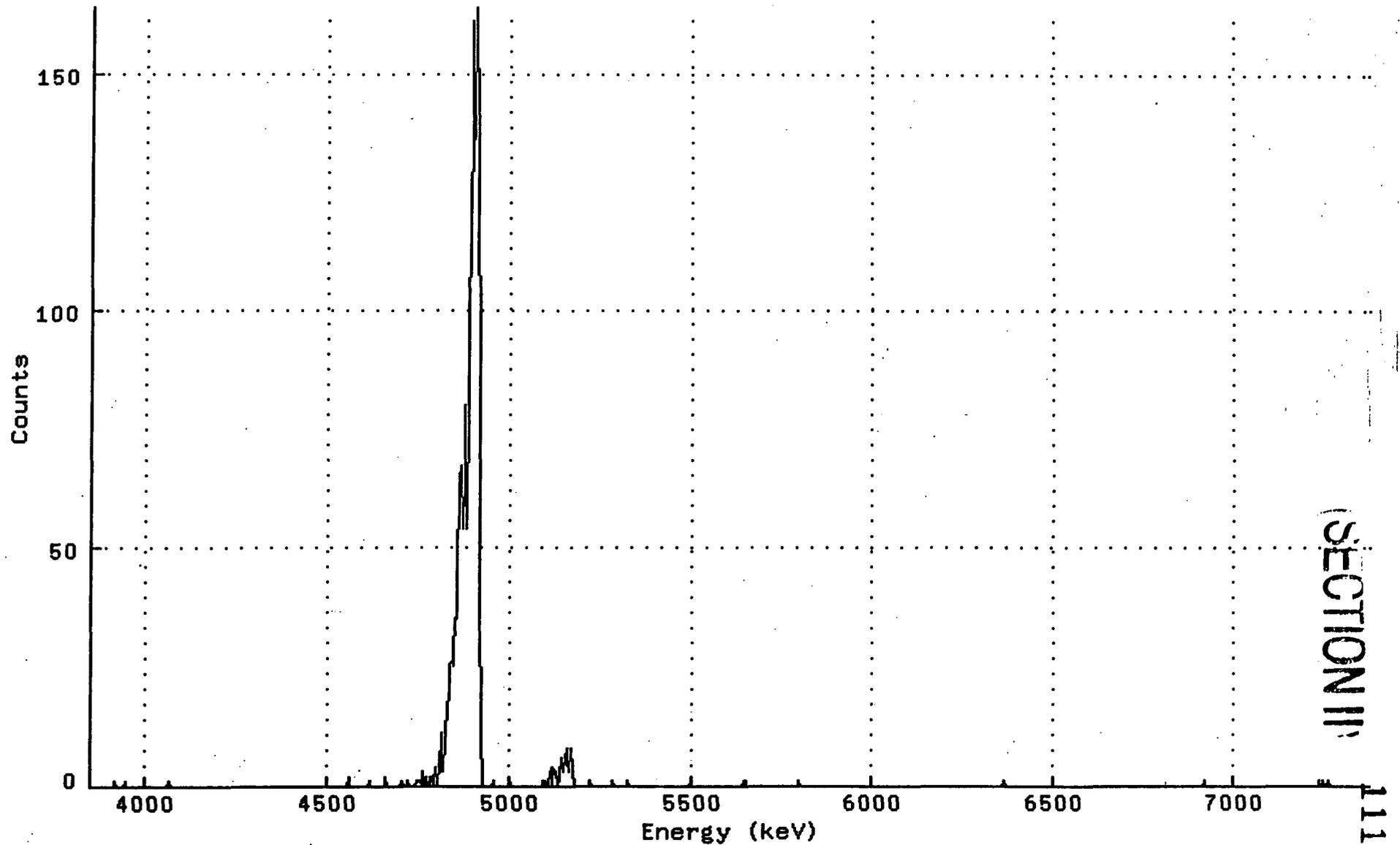
Title : 041

Sample Title:

Start Time: 7-DEC-1999 10:15: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.83753E+03

Real Time : 0 22:13:23.00 Sample ID : 263924 Energy Slope : 3.45395E+00

Live Time : 0 22:13:23.00 Sample Type: PU Energy Quad : 0.00000E+00



283

 Spectral File: ND_AMS_ARCHIVE_S:S_99126523\$263925_PU.CNF

BATCH ID:	99126523	*	SAMPLE ID:	263925
SAMPLE DATE:	29-NOV-1999 00:00	*	ALIQUOT:	3.050E-02 SA
SAMPLE TITLE:		*	DETECTOR NUMBER:	042
ACQ DATE:	7-DEC-1999 10:15	*	AVERAGE EFFICIENCY:	23.6%
ELAPSED LIVE TIME:	80004.	*	RECOVERY:	75.79%
TRACER ID:	PU242_82-76-1	*	TRACER FWHM (kev):	28.68
LAMBDA VALUE:	100.	*	ROI TYPE:	STANDARD
CORRECTED TRACER DPM:	9.235	*	CONFIDENCE LEVEL:	4.65
SAMPLE MATRIX:	MISC	*	LLD CONSTANT:	2.71
ENERGY CAL DATE:	3-DEC-1999 07:08	*	EFF CAL DATE:	3-DEC-1999 07:08
BKG FILENAME:	B_042_3DEC99	*		
		*		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/	TPU/ERROR SA 2-SIGMA	MDC dpm/	CRIT LEVEL SA dpm/	SA
PU-238	5487.1	18.80	1.20	99.9	2.590E+00	1.255E+00	1.075E+00	7.241E-01	
PU-239	5147.7	15.00	0.00	99.9	2.066E+00	1.073E+00	3.733E-01	3.733E-01	
PU242	4890.7	2209.20	0.80	100.4	3.028E+02	1.504E+01	9.415E-01	6.565E-01	

*** POSITIVE ***
 *** RECOUNT SAMPLE CL > 0.067 ***

Spectrum : WIZARD\$DRC200:[AHIGH.ALUSR.ARCHIVE.S]S_99126523\$263925_PU.CNF;2

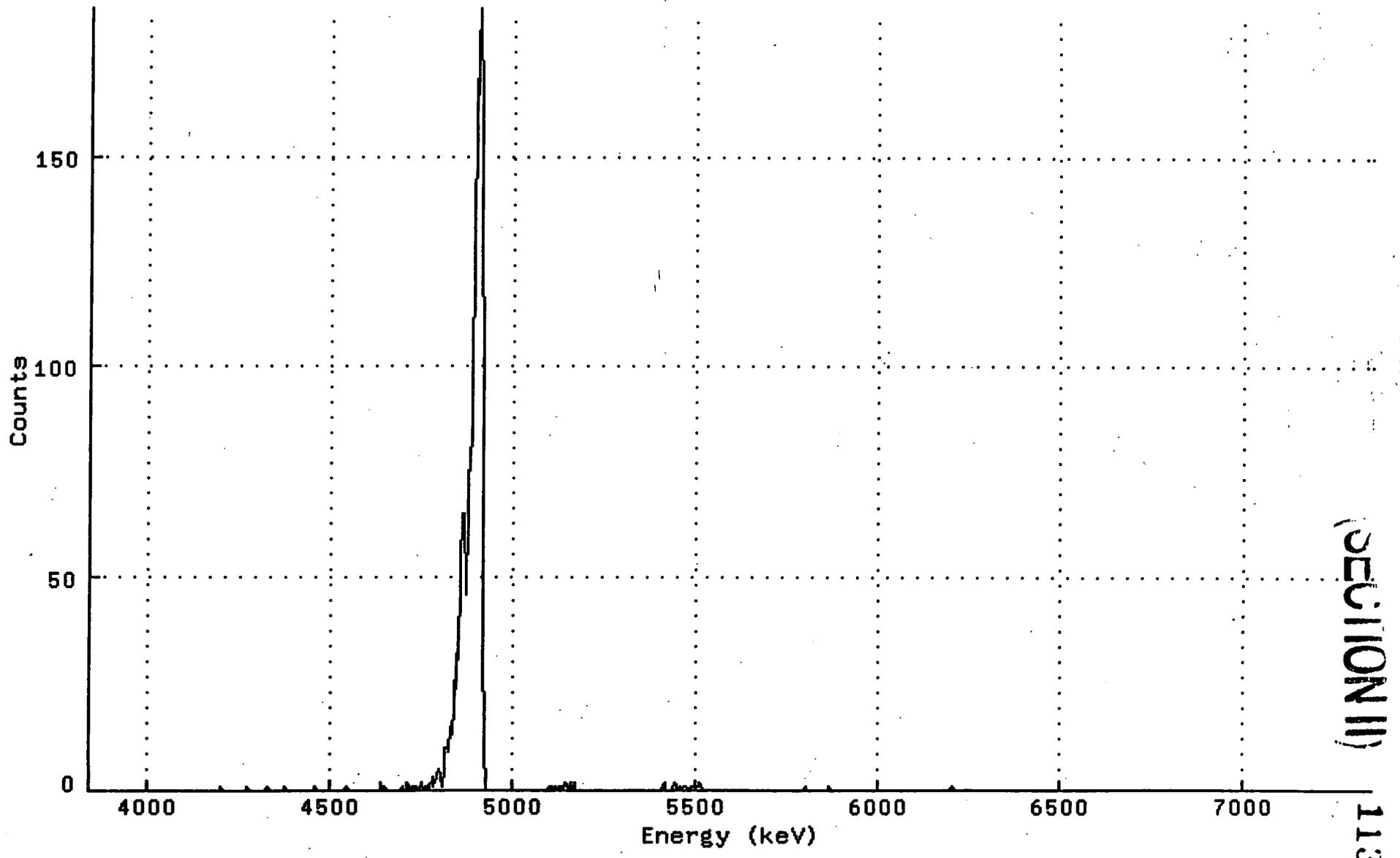
Title : 042

Sample Title:

Start Time: 7-DEC-1999 10:15: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.83215E+03

Real Time : 0 22:13:24.00 Sample ID : 263925 Energy Slope : 3.43781E+00

Live Time : 0 22:13:24.00 Sample Type: PU Energy Quad : 0.00000E+00



285

Spectral File: ND_AMS_ARCHIVE_S:S_99126523\$263926_PU.CNF

```

*
BATCH ID:                99126523      *      SAMPLE ID:                263926
SAMPLE DATE:            29-NOV-1999 00:00 *      ALIQUOT:                  4.940E-02      SA
SAMPLE TITLE:          *      DETECTOR NUMBER:          043
ACQ DATE:              7-DEC-1999 10:15 *      AVERAGE EFFICIENCY:      23.1%
ELAPSED LIVE TIME:     80003.          *      RECOVERY:                73.38%
TRACER ID:            PU242_82-76-1    *      TRACER FWHM (kev):       30.91
LAMBDA VALUE:         100.            *      ROI TYPE:                STANDARD
CORRECTED TRACER DPM:  9.235          *      CONFIDENCE LEVEL:       4.65
SAMPLE MATRIX:        MISC            *      LLD CONSTANT:           2.71
ENERGY CAL DATE:     3-DEC-1999 07:10 *      EFF CAL DATE:           3-DEC-1999 07:10
BKG FILENAME:        B_043_3DEC99     *
*

```

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/ SA	TPU/ERROR 2-SIGMA	MDC dpm/ SA	CRIT LEVEL dpm/ SA
PU-238	5487.1	2.00	0.00	99.9	1.792E-01	2.537E-01	2.428E-01	2.428E-01
PU-239	5147.7	0.60	2.40	99.9	5.375E-02	3.566E-01	8.883E-01	5.656E-01
PU242	4890.7	2096.80	1.20	100.4	1.869E+02	9.465E+00	6.958E-01	4.687E-01

*** RECOUNT SAMPLE CL > 0.067 ***

Spectrum : WIZARD\$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99126523\$263926_PU.CNF; 2

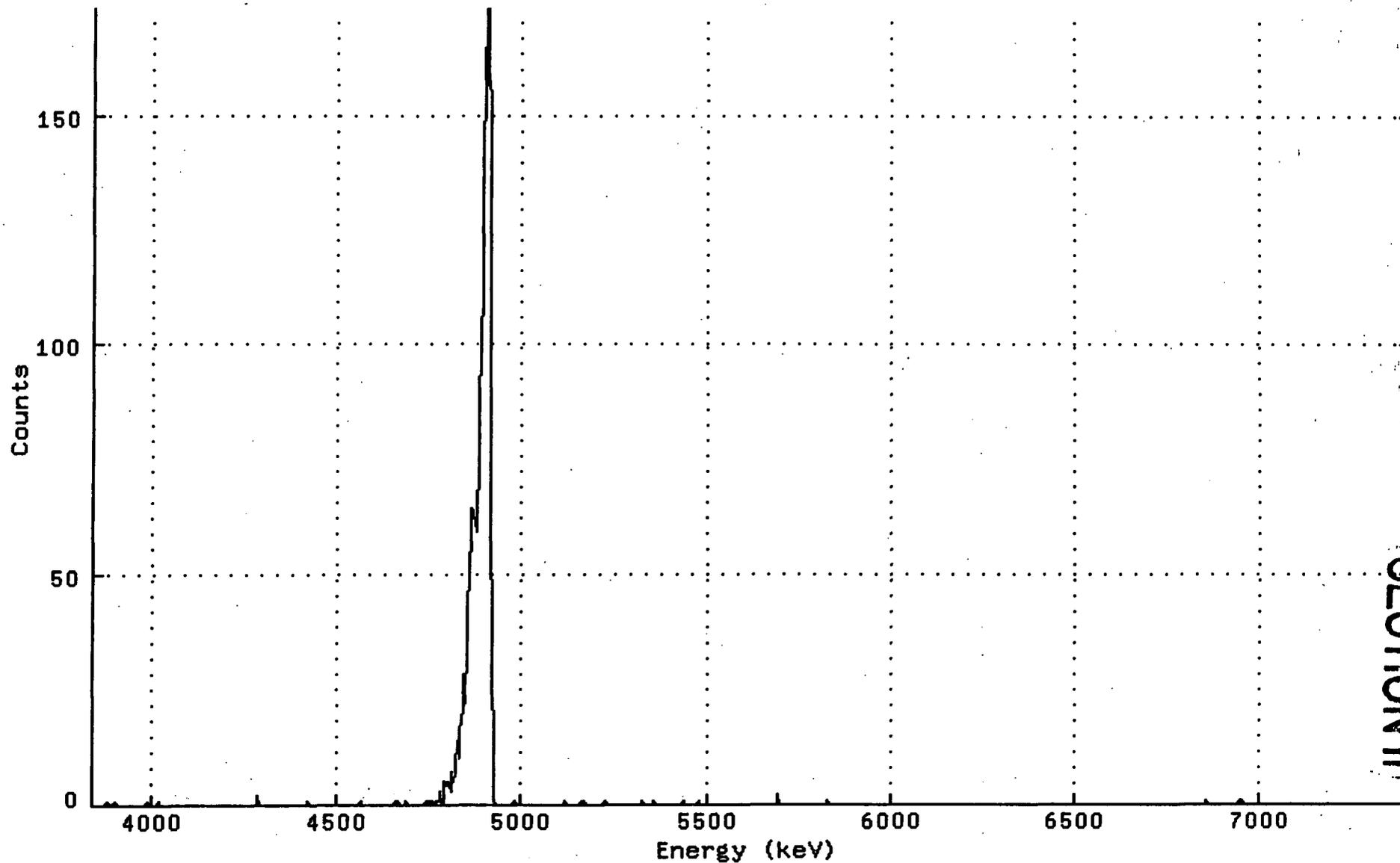
Title : 043

Sample Title:

Start Time: 7-DEC-1999 10:15: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.83028E+03

Real Time : 0 22:13:23.00 Sample ID : 263926 Energy Slope : 3.46730E+00

Live Time : 0 22:13:23.00 Sample Type: PU Energy Quad : 0.00000E+00



SECTION II

 Spectral File: ND_AMS_ARCHIVE_S:S_99126523\$263927_PU.CNF

BATCH ID:	99126523	*	SAMPLE ID:	263927
SAMPLE DATE:	29-NOV-1999 00:00	*	ALIQUOT:	5.500E-02 SA
SAMPLE TITLE:		*	DETECTOR NUMBER:	044
ACQ DATE:	7-DEC-1999 10:16	*	AVERAGE EFFICIENCY:	22.8%
ELAPSED LIVE TIME:	80000.	*	RECOVERY:	65.11%
TRACER ID:	PU242_82-76-1	*	TRACER FWHM (kev):	22.17
LAMBDA VALUE:	100.	*	ROI TYPE:	MANUAL
CORRECTED TRACER DPM:	9.235	*	CONFIDENCE LEVEL:	4.65
SAMPLE MATRIX:	MISC	*	LLD CONSTANT:	2.71
ENERGY CAL DATE:	3-DEC-1999 07:11	*	EFF CAL DATE:	3-DEC-1999 07:11
BKG FILENAME:	B_044_3DEC99	*		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/	TPU/ERROR SA 2-SIGMA	MDC dpm/	CRIT LEVEL SA dpm/
PU-238	5487.1	0.60	0.40	99.9	5.520E-02	1.982E-01	5.198E-01	3.845E-01
PU-239	5147.7	14.40	1.60	99.9	1.325E+00	7.545E-01	7.903E-01	5.198E-01
PU242	4890.7	1834.60	0.40	100.4	1.679E+02	8.949E+00	5.172E-01	3.826E-01

*** POSITIVE ***
 *** RECOUNT SAMPLE CL > 0.067 ***

Spectrum : WIZARD\$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99126523\$263927_PU.CNF;2

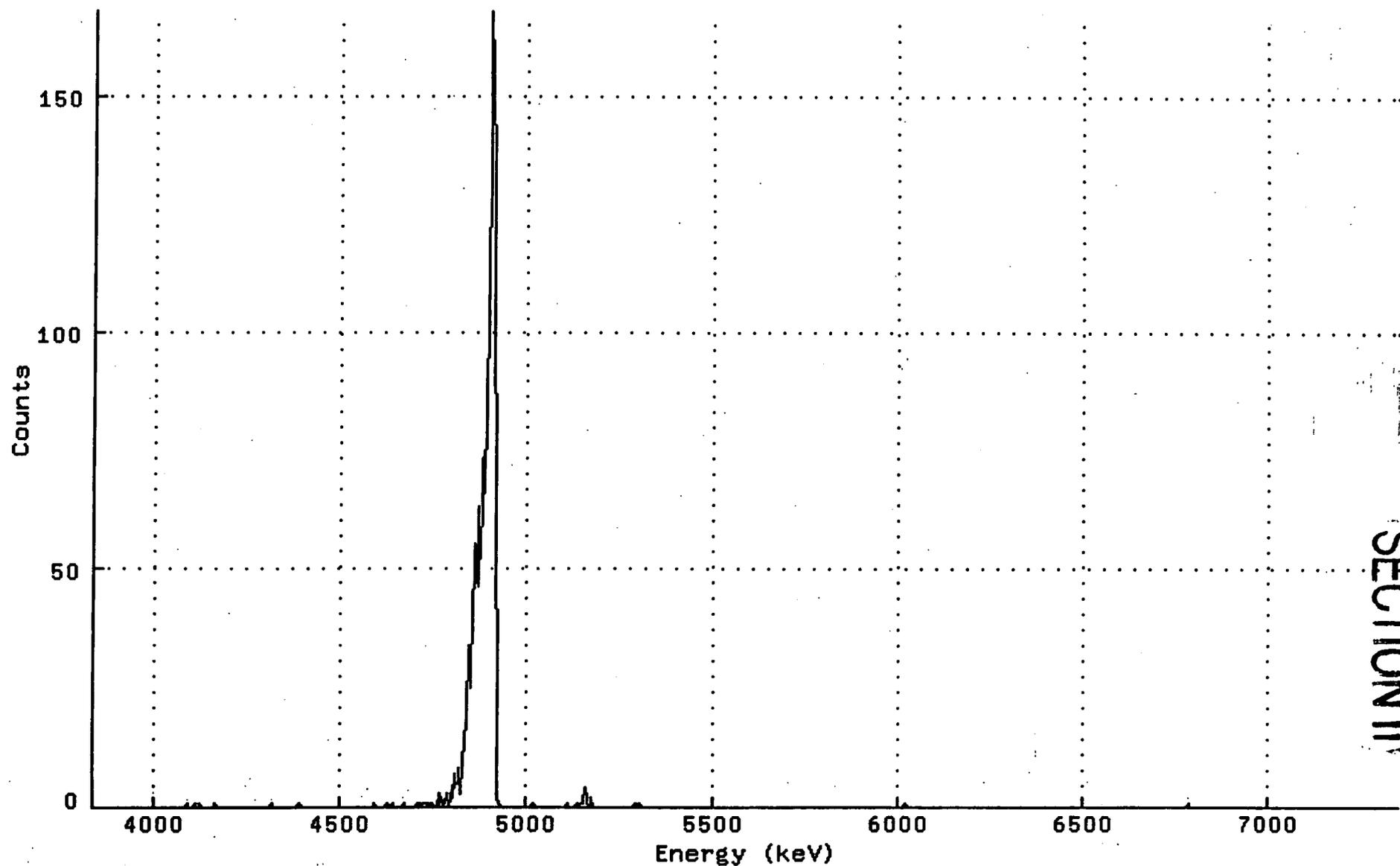
Title : 044

Sample Title:

Start Time: 7-DEC-1999 10:16: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.82640E+03

Real Time : 0 22:13:20.00 Sample ID : 263927 Energy Slope : 3.44100E+00

Live Time : 0 22:13:20.00 Sample Type: PU Energy Quad : 0.00000E+00



 Spectral File: ND_AMS_ARCHIVE_S:S_99126523\$263928_PU.CNF

BATCH ID:	99126523	*	SAMPLE ID:	263928
SAMPLE DATE:	29-NOV-1999 00:00	•	ALIQOT:	3.530E-02 SA
SAMPLE TITLE:		*	DETECTOR NUMBER:	045
ACQ DATE:	7-DEC-1999 10:16	*	AVERAGE EFFICIENCY:	23.5%
ELAPSED LIVE TIME:	80003.	*	RECOVERY:	76.14%
TRACER ID:	PU242_82-76-1	*	TRACER FWHM (kev):	30.87
LAMBDA VALUE:	100.	*	ROI TYPE:	STANDARD
CORRECTED TRACER DPM:	9.235	*	CONFIDENCE LEVEL:	4.65
SAMPLE MATRIX:	MISC	*	LLD CONSTANT:	2.71
ENERGY CAL DATE:	3-DEC-1999 07:13	*	EFF CAL DATE:	3-DEC-1999 07:13
BKG FILENAME:	B_045_3DEC99	*		

 NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/SA	TPU/ERROR 2-SIGMA	MDC dpm/SA	CRIT LEVEL dpm/SA
PU-238	5487.1	-0.40	0.40	99.9	-4.752E-02	9.508E-02	6.712E-01	4.965E-01
PU-239	5147.7	19.40	1.60	99.9	2.304E+00	1.113E+00	1.021E+00	6.712E-01
PU242	4890.7	2213.60	0.40	100.4	2.616E+02	1.296E+01	6.679E-01	4.941E-01

 *** POSITIVE ***
 *** RECOUNT SAMPLE CL > 0.067 ***

Spectrum : WIZARD\$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99126523\$263928_PU.CNF; 2

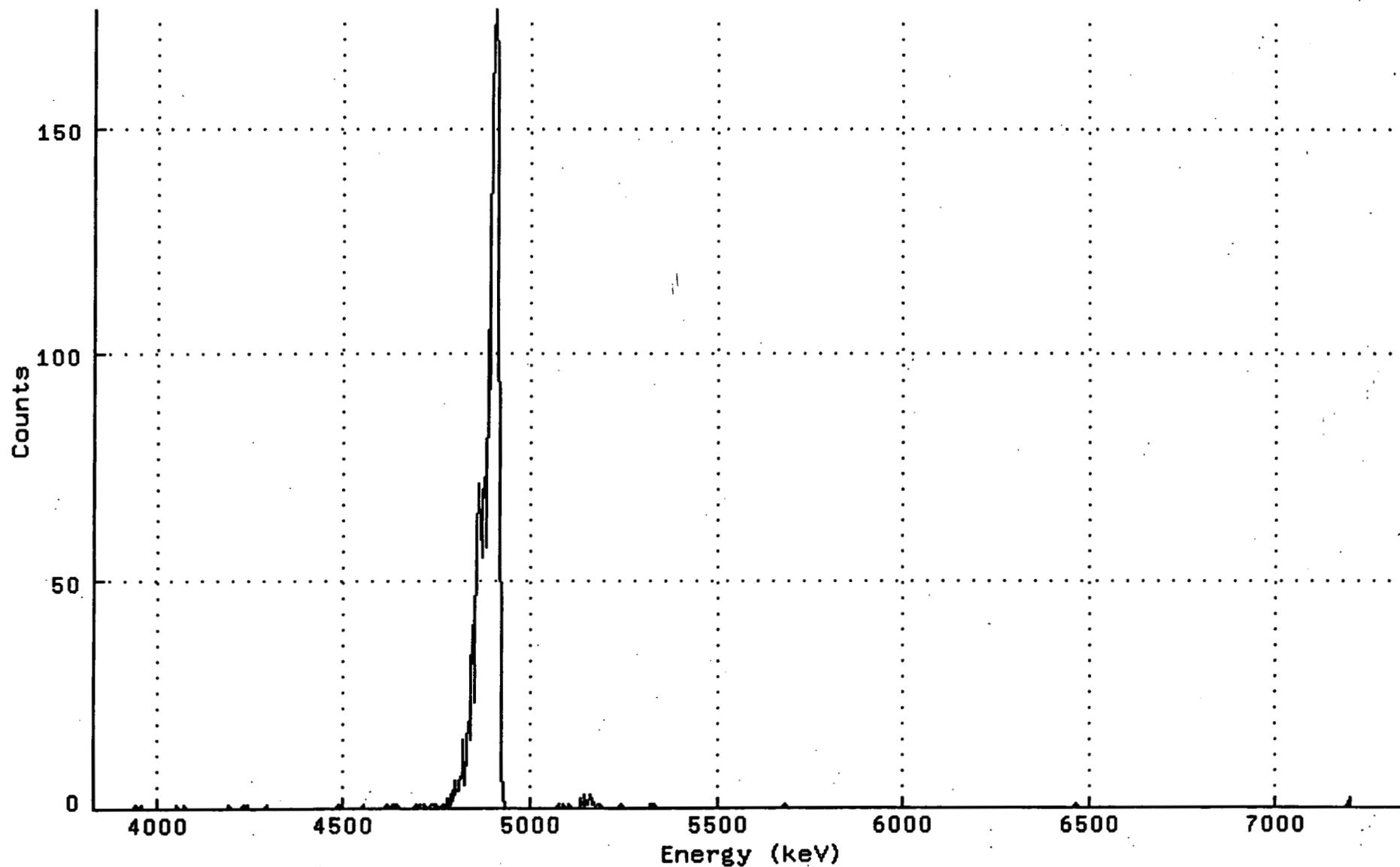
Title : 045

Sample Title:

Start Time: 7-DEC-1999 10:16: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.82089E+03

Real Time : 0 22:13:23.00 Sample ID : 263928 Energy Slope : 3.45370E+00

Live Time : 0 22:13:23.00 Sample Type: PU Energy Quad : 0.00000E+00



(SECTION II) 119

291

Spectral File: ND_AMS_ARCHIVE_S:S_99126523\$263929_PU.CNF

```

*
BATCH ID:          99126523      *      SAMPLE ID:          263929
SAMPLE DATE:      29-NOV-1999 00:00 *      ALIQUOT:           2.850E-02      SA
SAMPLE TITLE:     *      DETECTOR NUMBER:       046
ACQ DATE:         7-DEC-1999 10:18 *      AVERAGE EFFICIENCY: 23.6%
ELAPSED LIVE TIME: 80004.        *      RECOVERY:           71.59%
TRACER ID:        PU242_82-76-1  *      TRACER FWHM (kev):  29.33
LAMBDA VALUE:     100.           *      ROI TYPE:           STANDARD
CORRECTED TRACER DPM: 9.235      *      CONFIDENCE LEVEL:   4.65
SAMPLE MATRIX:    MISC           *      LLD CONSTANT:       2.71
ENERGY CAL DATE:  3-DEC-1999 07:14 *      EFF CAL DATE:       3-DEC-1999 07:14
BKG FILENAME:     B_046_3DEC99   *
*

```

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/	TPU/ERROR SA 2-SIGMA	MDC dpm/	CRIT LEVEL SA dpm/
PU-238	5487.1	-0.20	1.20	99.9	-3.113E-02	3.787E-01	1.214E+00	8.179E-01
PU-239	5147.7	9.40	1.60	99.9	1.463E+00	1.065E+00	1.337E+00	8.793E-01
PU242	4890.7	2093.00	0.00	100.4	3.240E+02	1.642E+01	4.196E-01	4.196E-01

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.067 ***

Spectrum : WIZARD\$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99126523\$263929_PU.CNF; 2

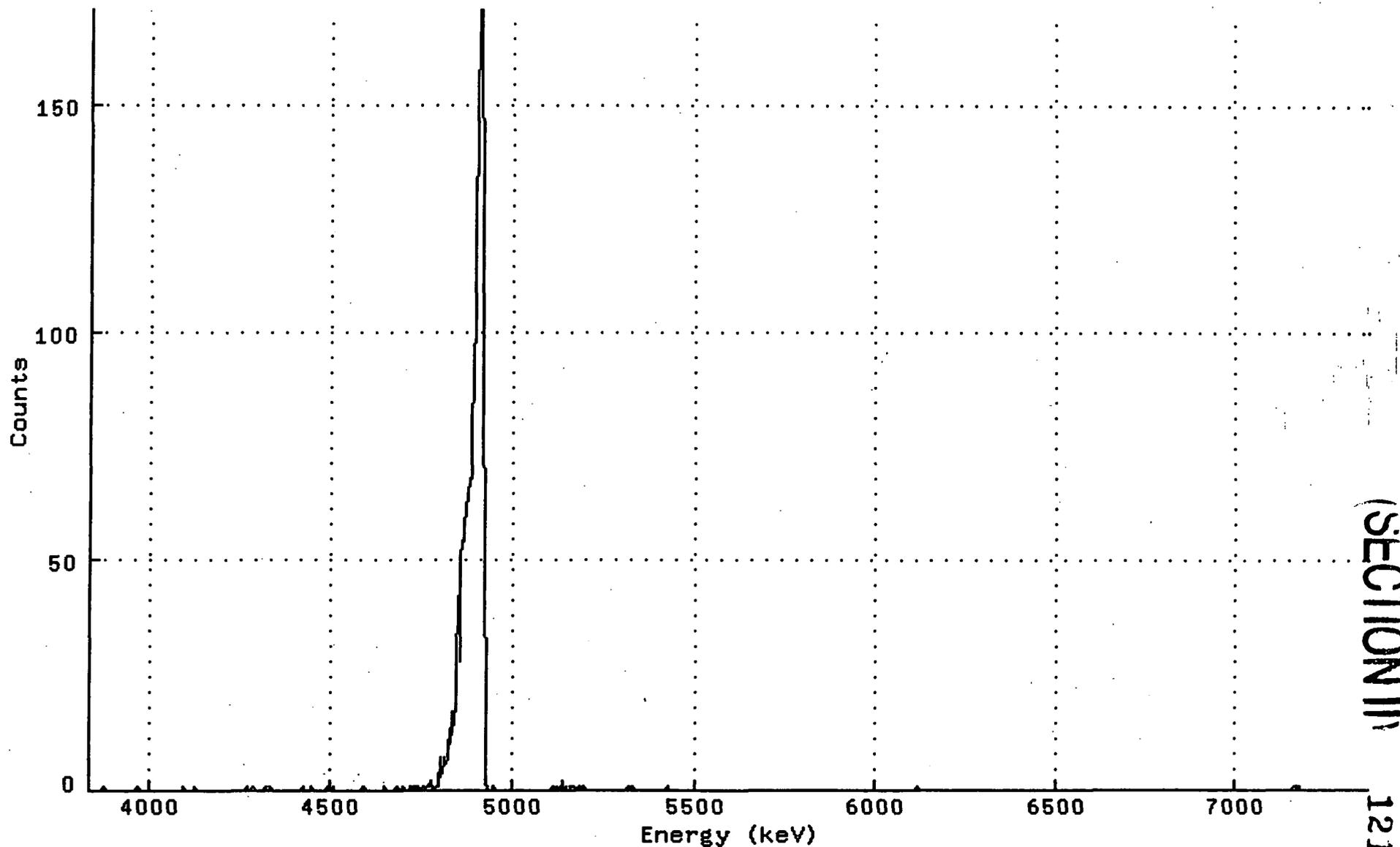
Title : 046

Sample Title:

Start Time: 7-DEC-1999 10:18: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.82498E+03

Real Time : 0 22:13:24.00 Sample ID : 263929 Energy Slope : 3.45799E+00

Live Time : 0 22:13:24.00 Sample Type: PU Energy Quad : 0.00000E+00



(SECTION II) 121

293

Spectral File: ND_AMS_ARCHIVE_S:S_99126523\$263930_PU.CNF

BATCH ID:	99126523	*	SAMPLE ID:	263930
SAMPLE DATE:	29-NOV-1999 00:00	*	ALIQUOT:	4.880E-02 SA
SAMPLE TITLE:		*	DETECTOR NUMBER:	047
ACQ DATE:	7-DEC-1999 10:17	*	AVERAGE EFFICIENCY:	23.3%
ELAPSED LIVE TIME:	80002.	*	RECOVERY:	71.43%
TRACER ID:	PU242_82-76-1	*	TRACER FWHM (kev):	34.49
LAMBDA VALUE:	100.	*	ROI TYPE:	MANUAL
CORRECTED TRACER DPM:	9.235	•	CONFIDENCE LEVEL:	4.65
SAMPLE MATRIX:	MISC	*	LLD CONSTANT:	2.71
ENERGY CAL DATE:	3-DEC-1999 07:15	*	EFF CAL DATE:	3-DEC-1999 07:15
BKG FILENAME:	B_047_3DEC99	*		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET	BKG	%ABN	ACTIVITY	TPU/ERROR	MDC	CRIT LEVEL
		AREA			dpm/	SA	2-SIGMA	dpm/
PU-238	5487.1	-1.40	2.40	99.9	-1.294E-01	2.588E-01	9.159E-01	5.831E-01
PU-239	5147.7	2.60	0.40	99.9	2.402E-01	3.287E-01	5.221E-01	3.862E-01
PU242	4890.7	2058.60	0.40	100.4	1.892E+02	9.643E+00	5.195E-01	3.843E-01

*** RECOUNT SAMPLE CL > 0.067 ***

Spectrum : WIZARD\$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99126523\$263930_PU.CNF; 2

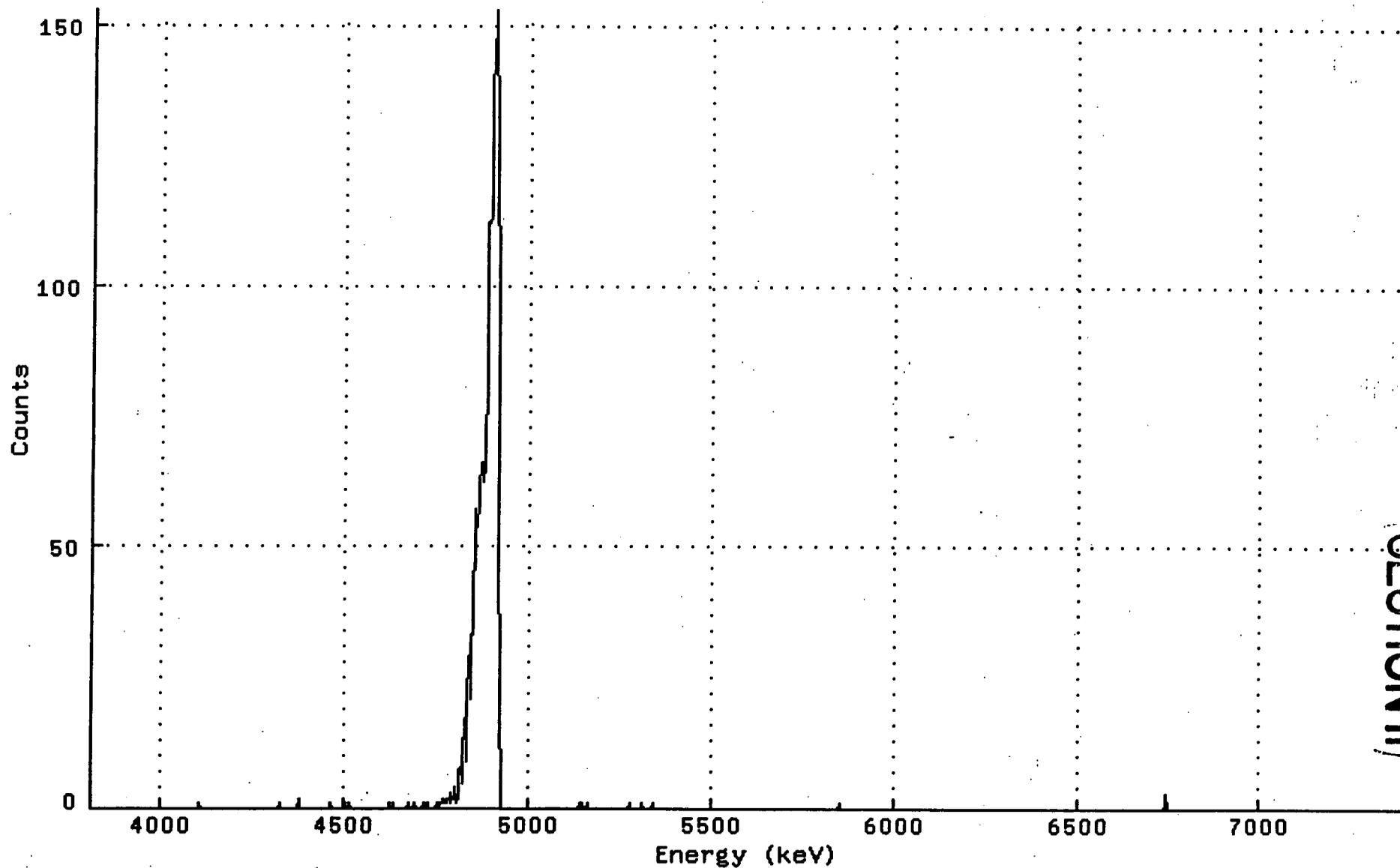
Title : 047

Sample Title:

Start Time: 7-DEC-1999 10:17: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.79994E+03

Real Time : 0 22:13:22.00 Sample ID : 263930 Energy Slope : 3.50515E+00

Live Time : 0 22:13:22.00 Sample Type: PU Energy Quad : 0.00000E+00



SECTION II)

123

295

Spectral File: ND_AMS_ARCHIVE S:S_99126523\$263921D_PU.CNF

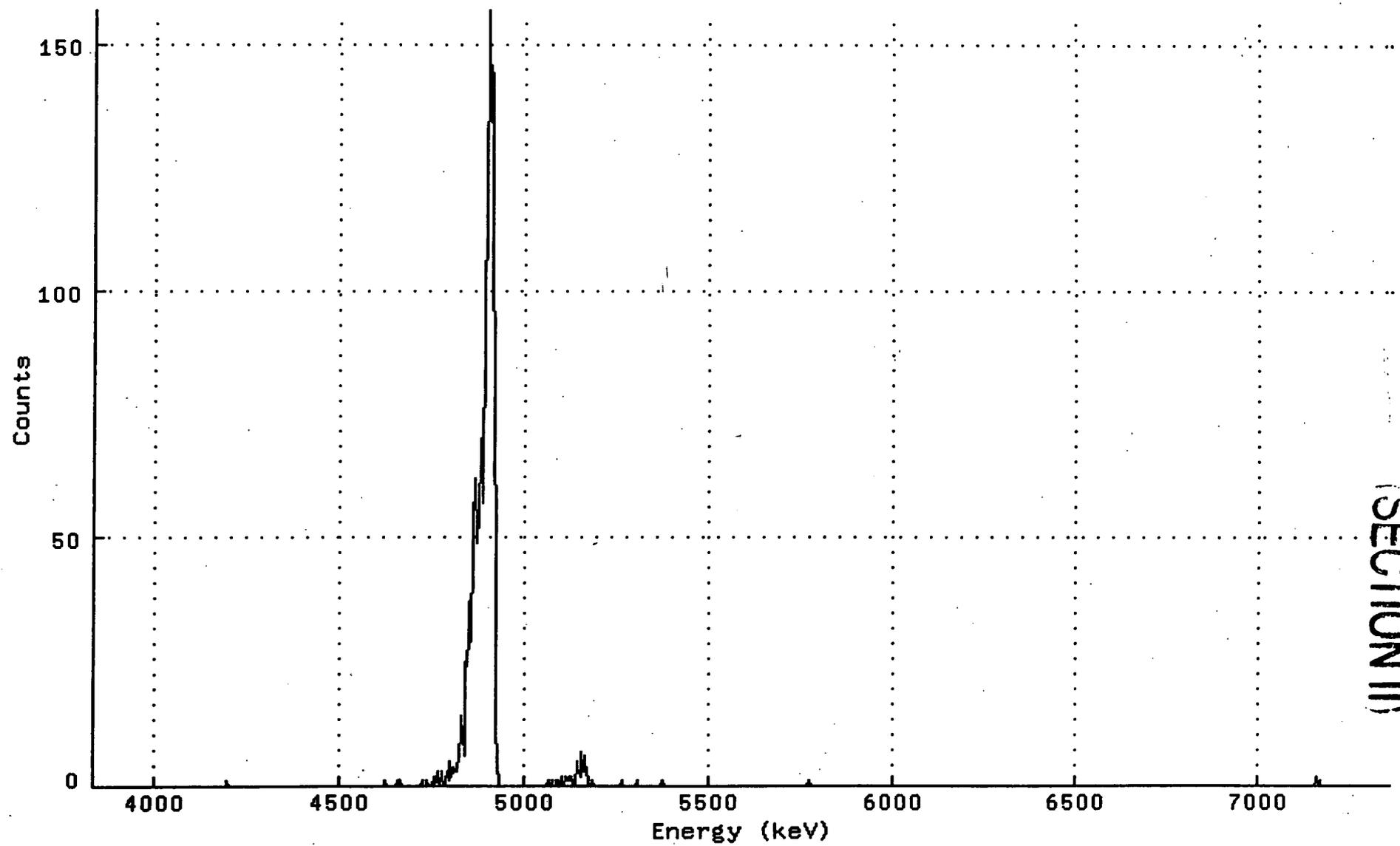
BATCH ID:	99126523	SAMPLE ID:	263921D
SAMPLE DATE:	29-NOV-1999 00:00	ALIQUOT:	3.930E-02 SA
SAMPLE TITLE:		DETECTOR NUMBER:	048
ACQ DATE:	7-DEC-1999 10:17	AVERAGE EFFICIENCY:	22.7%
ELAPSED LIVE TIME:	80004.	RECOVERY:	66.85%
TRACER ID:	PU242_82-76-1	TRACER FWHM (kev):	29.11
LAMBDA VALUE:	100.	ROI TYPE:	MANUAL
CORRECTED TRACER DPM:	9.235	CONFIDENCE LEVEL:	4.65
SAMPLE MATRIX:	MISC	LLD CONSTANT:	2.71
ENERGY CAL DATE:	3-DEC-1999 07:17	EFF CAL DATE:	3-DEC-1999 07:17
BKG FILENAME:	B_048_3DEC99		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/SA	TPU/ERROR 2-SIGMA	MDC dpm/SA	CRIT LEVEL dpm/SA
PU-238	5487.1	0.60	0.40	99.9	7.546E-02	2.709E-01	7.106E-01	5.257E-01
PU-239	5147.7	52.80	1.20	99.9	6.639E+00	1.897E+00	9.813E-01	6.610E-01
PU242	4890.7	1878.20	0.80	100.4	2.350E+02	1.241E+01	8.594E-01	5.992E-01

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.067 ***

Spectrum : WIZARD\$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99126523\$263921D_PU.CNF; 2
Title : 048
Sample Title:
Start Time: 7-DEC-1999 10:17: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.82185E+03
Real Time : 0 22:13:24.00 Sample ID : 263921D Energy Slope : 3.45055E+00
Live Time : 0 22:13:24.00 Sample Type: PU Energy Quad : 0.00000E+00



(SECTION II)

125

297

 Spectral File: ND_AMS_ARCHIVE_C:C_99126523\$LCSWR33_PU.CNF

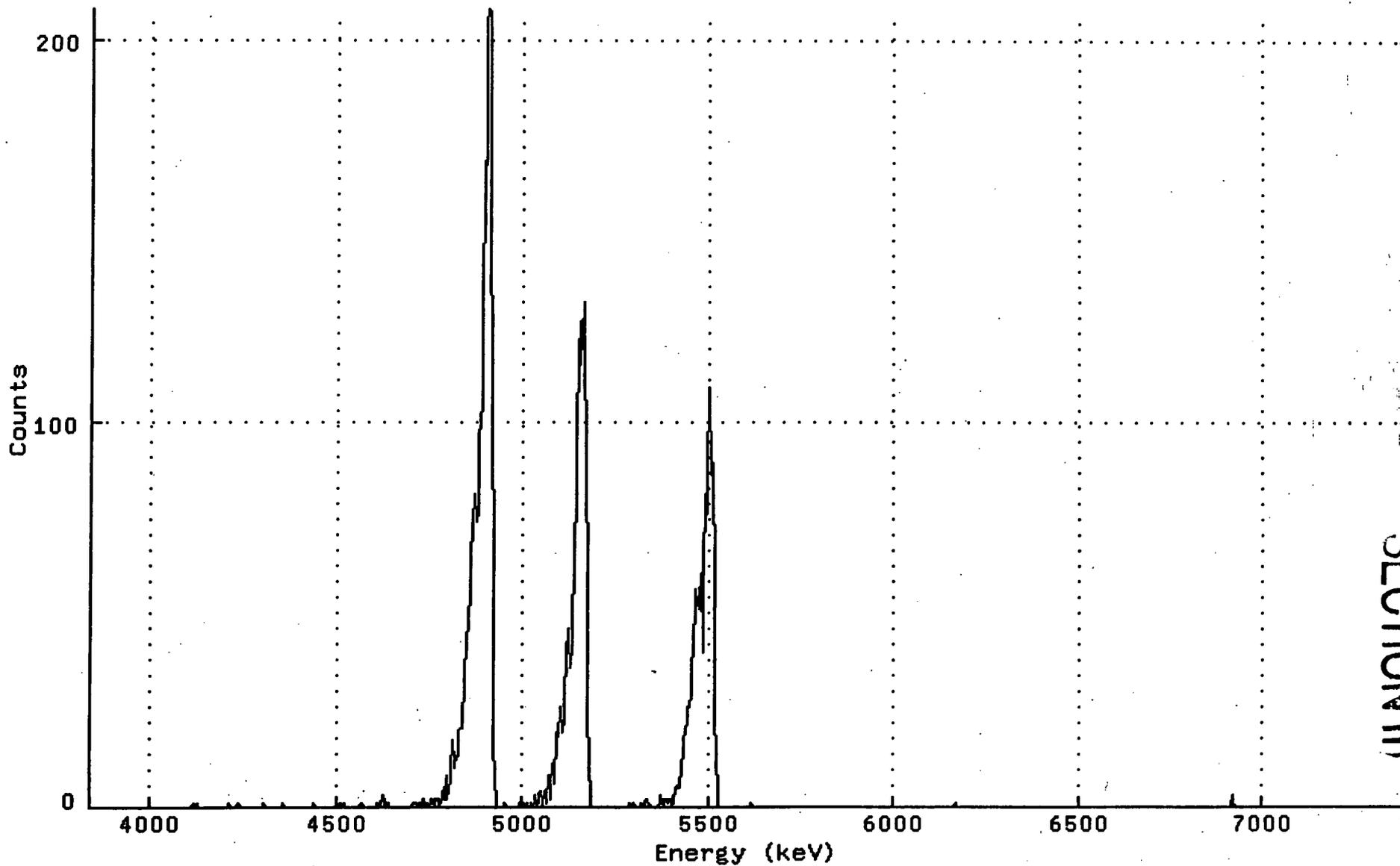
BATCH ID:	99126523	SAMPLE ID:	LCSWR33
SAMPLE DATE:	1-JAN-1987 00:00	ALIQUOT:	2.500E-01 mL
SAMPLE TITLE:		DETECTOR NUMBER:	033
ACQ DATE:	8-DEC-1999 09:50	AVERAGE EFFICIENCY:	26.7%
ELAPSED LIVE TIME:	80003.	RECOVERY:	77.57%
TRACER ID:	PU242_82-76-1	TRACER FWHM (kev):	29.62
LAMBDA VALUE:	100.	ROI TYPE:	STANDARD
CORRECTED TRACER DPM:	9.235	CONFIDENCE LEVEL:	4.65
SAMPLE MATRIX:	MISC	LLD CONSTANT:	2.71
ENERGY CAL DATE:	3-DEC-1999 06:50	EFF CAL DATE:	3-DEC-1999 06:50
BKG FILENAME:	B_033_3DEC99		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY pCi/ mL	TPU/ERROR 2-SIGMA	MDC pCi/ mL	CRIT LEVEL pCi/ mL
PU-238	5487.1	1412.20	0.80	99.9	1.022E+01	7.699E-01	4.488E-02	3.129E-02
PU-239	5147.7	1627.40	1.60	99.9	1.064E+01	7.745E-01	5.614E-02	3.692E-02
PU242	4890.7	2559.40	1.60	100.4	1.664E+01	7.809E-01	5.586E-02	3.674E-02

*** POSITIVE ***

Spectrum : WIZARD\$DKC200:[AHIGH.ALUSR.ARCHIVE.C]C_99126523\$LCSWR33_PU.CNF; 3
Title : 033
Sample Title:
Start Time: 8-DEC-1999 09:50: Sample Time: 1-JAN-1987 00:00: Energy Offset: 3.82871E+03
Real Time : 0 22:13:23.00 Sample ID : LCSWR33 Energy Slope : 3.45977E+00
Live Time : 0 22:13:23.00 Sample Type: PU Energy Quad : 0.00000E+00



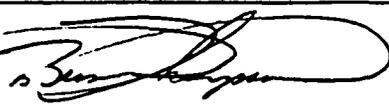
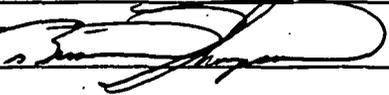
SECTION III 127

Sample Preparation and Analysis Log

SECTION III

128

Sample Type: Various Solids

Method	Isotopes	Worklist Names	Chemist	Date	
Digestion & Purification	RC-19 R06	Am-241	99126525		12/1/99
		Pu-239/240, Pu-238	99126526		
		U-238, U235, U234	99126527		
Counting	RC-19 R06	Pu^{238}	99126526		12/1/99

Tracers (Internal Standards)

Isotope	ID	Conc(pCi/mL) @ RD	Aliquot(mL)	HL (years)	Activity(dpm)	Activity(pCi)
U-232	178-06-3	50.91 12/15/92	0.100	72	10.57	4.76
Am-243	82-76-2	50.80 12/15/92	0.100	7380	11.27	5.08
Pu-242	82-76-1	41.60 12/18/89	0.100	3.758E+05	9.24	4.16

Req	Sample ID	#	Aliquot Size	Comments/ Analysis	Sample Aliquot	Detector Number	Tare Weight(g)	Sample & Container(g)	Total Sample Size (g)
	PB	1	1 SA			34			
16848	263931	2	0.500 G		0.0631	35	14.612	22.537	7.925
16848	263932	3	0.500 G		0.0279	36	14.656	32.546	17.890
16848	263933	4	0.500 G		0.0418	37	14.692	26.665	11.973
16848	263934	5	0.500 G		0.0391	38	14.616	27.414	12.798
16848	263935	6	0.500 G		0.0328	39	14.529	29.793	15.264
16848	263936	7	0.500 G		0.0453	40	14.562	25.595	11.033
16848	263937	8	0.500 G		0.0389	41	14.530	27.384	12.854
16848	263938	9	0.500 G		0.0636	42	14.670	22.536	7.866
16848	263939	10	0.500 G		0.0461	43	14.535	25.378	10.843
16848	263940	11	0.500 G		0.0667	44	14.642	22.133	7.491
16848	263941	12	0.500 G		0.0376	45	14.702	27.993	13.291
16848	263942	13	0.500 G		0.0373	46	14.551	27.966	13.415
16848	263943	14	0.500 G		0.0523	47	14.562	24.115	9.553
16848	263944	15	0.500 G		0.0324	48	14.679	30.113	15.434
16848	263931D	16	0.500 G		0.0631	35	14.612	22.537	7.925
LCSWR1, LCSWR33		17	0.250 mL			34			
		18							
		19							
		20							
		21							
		22							
		23							
		24							
		25							
		26							
		27							
		28							
		29							
		30							

Comments and Actual conditions:

- Start date: 12/1/99
- Automatic pipets calibrated in accord with QC-6 on balance # 15
- Balance # 5 used for weights of samples and their aliquots
- Sample aliquot is the fraction of the total sample taken for analysis

OICAN
12/13/99
Oidby
S. Houty
12/13/99

Spectral File: ND_AMS_ARCHIVE_R:R_99126526\$PB_PU.CNF

```
BATCH ID: 99126526 * SAMPLE ID: PB
SAMPLE DATE: 29-NOV-1999 00:00 * ALIQUOT: 1.000E+00 SA
SAMPLE TITLE: * DETECTOR NUMBER: 034
ACQ DATE: 8-DEC-1999 09:51 * AVERAGE EFFICIENCY: 22.1%
ELAPSED LIVE TIME: 80001. * RECOVERY: 71.22%
TRACER ID: PU242_82-76-1 * TRACER FWHM (kev): 25.40
LAMBDA VALUE: 100. * ROI TYPE: STANDARD
CORRECTED TRACER DPM: 9.235 * CONFIDENCE LEVEL: 4.65
SAMPLE MATRIX: MISC * LLD CONSTANT: 2.71
ENERGY CAL DATE: 3-DEC-1999 06:51 * EFF CAL DATE: 3-DEC-1999 06:51
BKG FILENAME: B_034_3DEC99 *
*
```

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/	TPU/ERROR SA 2-SIGMA	MDC dpm/	CRIT LEVEL SA dpm/
PU-238	5487.1	0.20	0.80	99.9	9.530E-04	1.095E-02	3.272E-02	2.282E-02
PU-239	5147.7	0.60	2.40	99.9	2.858E-03	1.896E-02	4.723E-02	3.007E-02
PU242	4890.7	1948.20	2.80	100.4	9.235E+00	4.817E-01	4.973E-02	3.129E-02

Spectrum : WIZARD\$DKC200: [AHIGH.ALUSR.ARCHIVE.R]R_99126526\$PB_PU.CNF; 3

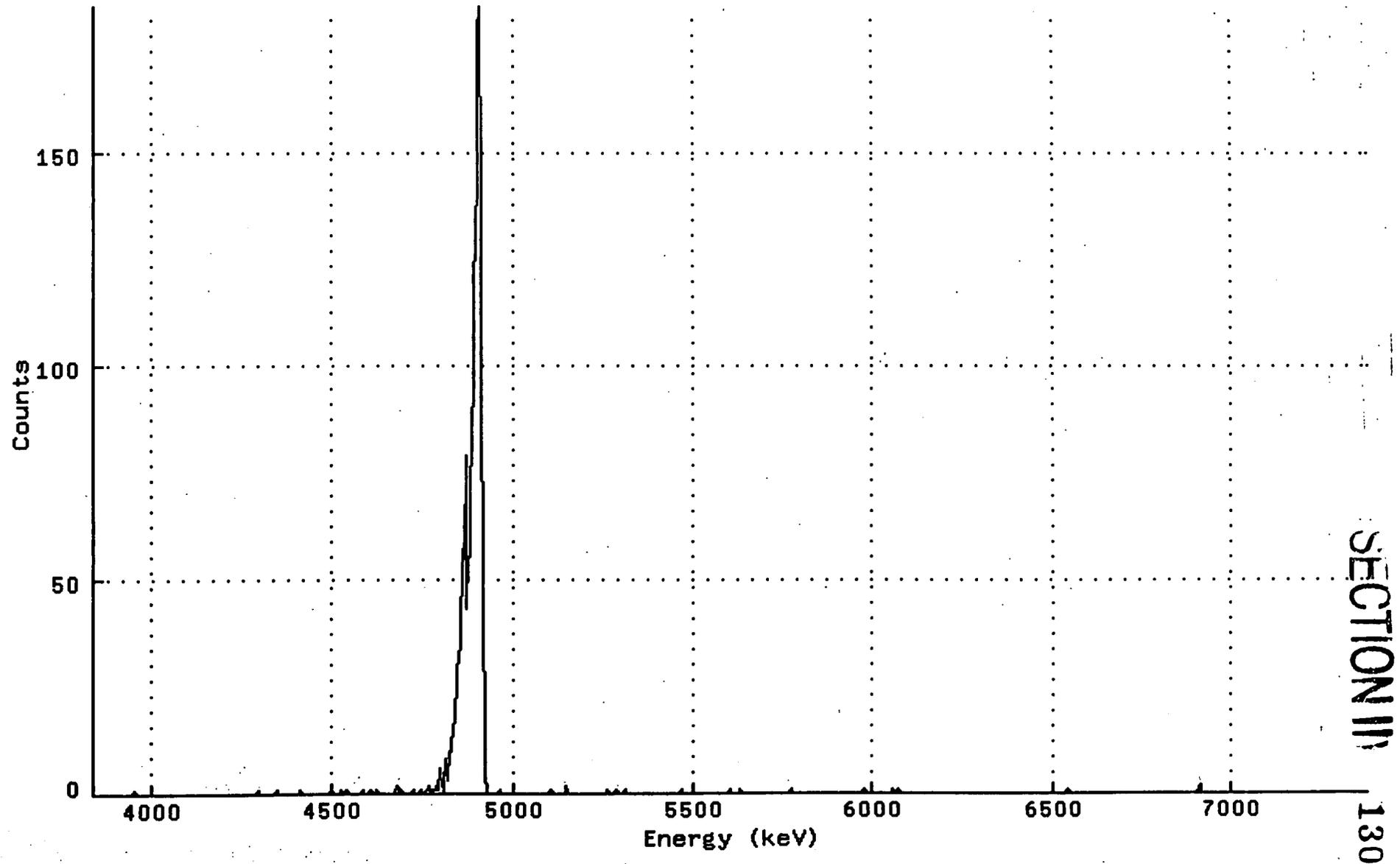
Title : 034

Sample Title:

Start Time: 8-DEC-1999 09:51: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.82875E+03

Real Time : 0 22:13:21.00 Sample ID : PB Energy Slope : 3.46609E+00

Live Time : 0 22:13:21.00 Sample Type: PU Energy Quad : 0.00000E+00



302

Spectral File: ND_AMS_ARCHIVE_S:S_99126526\$263931_PU.CNF

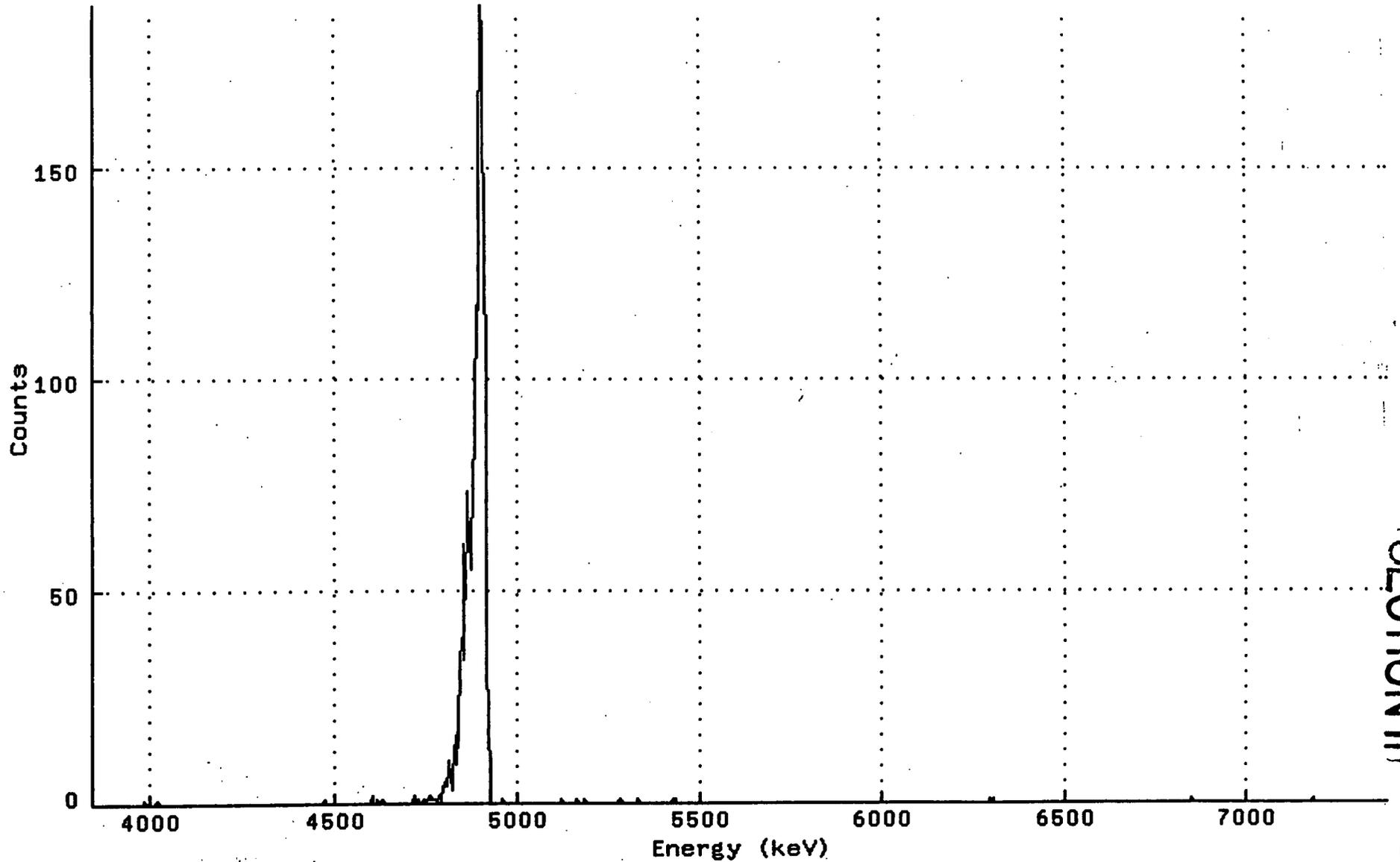
```
*****  
BATCH ID: 99126526 * SAMPLE ID: 263931  
SAMPLE DATE: 29-NOV-1999 00:00 * ALIQUOT: 6.310E-02 SA  
SAMPLE TITLE: * DETECTOR NUMBER: 035  
ACQ DATE: 8-DEC-1999 09:52 * AVERAGE EFFICIENCY: 26.3%  
ELAPSED LIVE TIME: 80003. * RECOVERY: 65.39%  
TRACER ID: PU242_82-76-1 * TRACER FWHM (kev): 27.27  
LAMBDA VALUE: 100. * ROI TYPE: STANDARD  
CORRECTED TRACER DPM: 9.235 * CONFIDENCE LEVEL: 4.65  
SAMPLE MATRIX: MISC * LLD CONSTANT: 2.71  
ENERGY CAL DATE: 3-DEC-1999 06:53 * EFF CAL DATE: 3-DEC-1999 06:53  
BKG FILENAME: B_035_3DEC99 *  
*****
```

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/SA	TPU/ERROR 2-SIGMA	MDC dpm/SA	CRIT LEVEL dpm/SA
U-238	5487.1	1.60	0.40	99.9	1.107E-01	2.034E-01	3.907E-01	2.891E-01
U-239	5147.7	2.20	0.80	99.9	1.521E-01	2.521E-01	4.750E-01	3.312E-01
PU242	4890.7	2127.20	0.80	100.4	1.464E+02	7.353E+00	4.726E-01	3.295E-01

*** RECOUNT SAMPLE CL > 0.067 ***

Spectrum : WIZARD\$DKC200: [AHIGH.ALUSR.ARCHIVE.S]S_99126526\$263931_PU.CNF; 3
Title : 035
Sample Title:
Start Time: 8-DEC-1999 09:52: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.83117E+03
Real Time : 0 22:13:23.00 Sample ID : 263931 Energy Slope : 3.47159E+00
Live Time : 0 22:13:23.00 Sample Type: PU Energy Quad : 0.00000E+00



(SECTION II)

132

304

Spectral File: ND_AMS_ARCHIVE_S:S_99126526\$263932_PU.CNF

```

*
BATCH ID:          99126526      *      SAMPLE ID:          263932
SAMPLE DATE:      29-NOV-1999 00:00 *      ALIQUOT:           2.790E-02   SA
SAMPLE TITLE:    *      DETECTOR NUMBER:         036
ACQ DATE:        8-DEC-1999 09:52 *      AVERAGE EFFICIENCY:      23.6%
ELAPSED LIVE TIME: 80007.        *      RECOVERY:                70.43%
TRACER ID:       PU242_82-76-1   *      TRACER FWHM (kev):       28.90
LAMBDA VALUE:    100.            *      ROI TYPE:                STANDARD
CORRECTED TRACER DPM: 9.235      *      CONFIDENCE LEVEL:        4.65
SAMPLE MATRIX:   MISC            *      LLD CONSTANT:           2.71
ENERGY CAL DATE: 3-DEC-1999 06:55 *      EFF CAL DATE:           3-DEC-1999 06:55
BKG FILENAME:    B_036_3DEC99   *
*

```

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/SA	TPU/ERROR 2-SIGMA	MDC dpm/SA	CRIT LEVEL dpm/SA
PU-238	5487.1	0.60	0.40	99.9	9.696E-02	3.481E-01	9.130E-01	6.754E-01
PU-239	5147.7	-0.40	2.40	99.9	-6.465E-02	5.560E-01	1.602E+00	1.020E+00
PU242	4890.7	2059.00	0.00	100.4	3.310E+02	1.687E+01	4.357E-01	4.357E-01

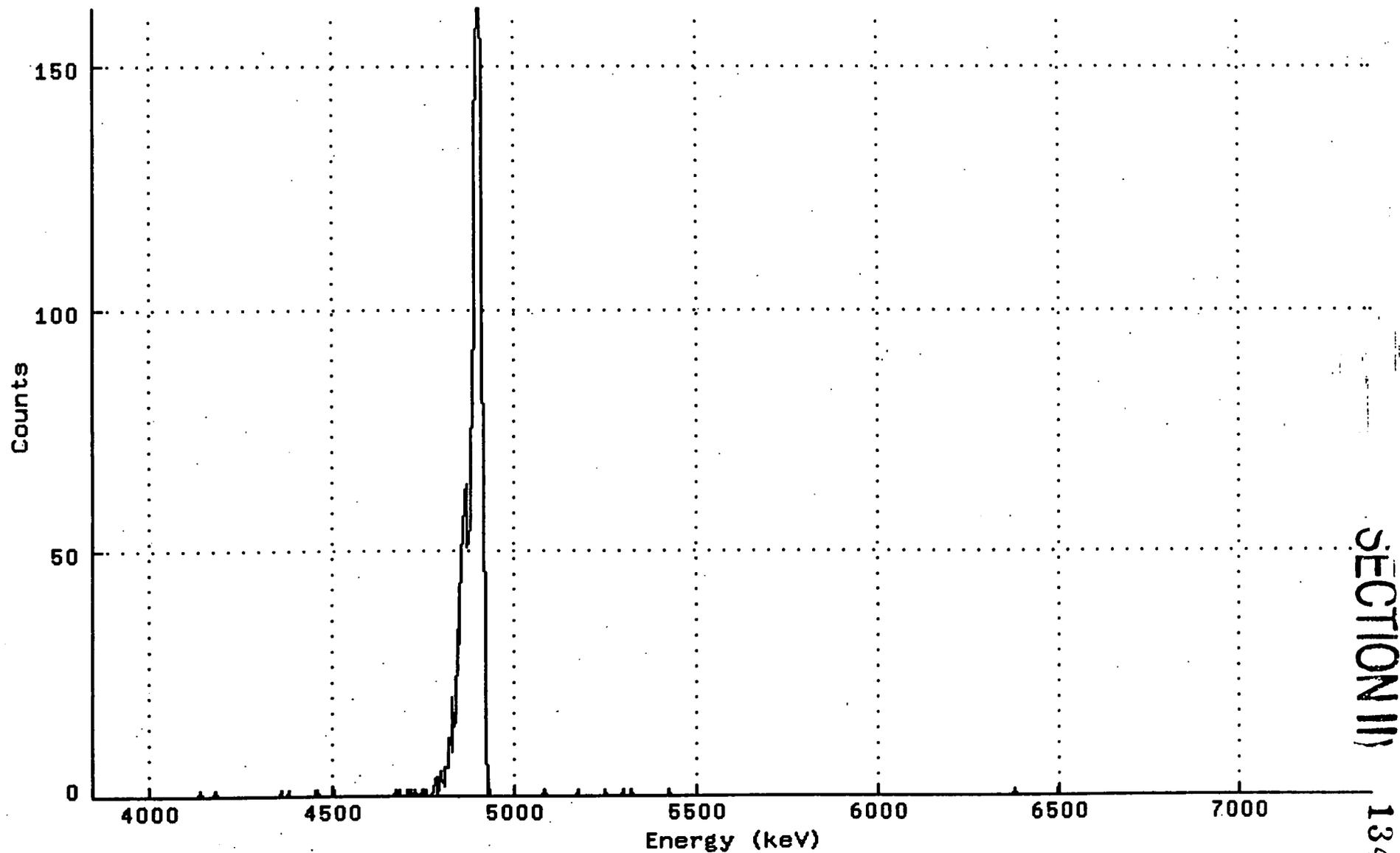
*** RECOUNT SAMPLE CL > 0.067 ***

Spectrum : WIZARD\$DKC200: [AHIGH.ALUSR.ARCHIVE.S]S_99126526\$263932_PU.CNF; 3

Title : 036

Sample Title:

Start Time: 8-DEC-1999 09:52:	Sample Time: 29-NOV-1999 00:00	Energy Offset: 3.83429E+03
Real Time : 0 22:13:27.00	Sample ID : 263932	Energy Slope : 3.44342E+00
Live Time : 0 22:13:27.00	Sample Type: PU	Energy Quad : 0.00000E+00



306

Spectral File: ND_AMS_ARCHIVE_S:S_99126526\$263933_PU.CNF

```
*****  
BATCH ID: 99126526 * SAMPLE ID: 263933  
SAMPLE DATE: 29-NOV-1999 00:00 * ALIQUOT: 4.180E-02 SA  
SAMPLE TITLE: * DETECTOR NUMBER: 037  
ACQ DATE: 8-DEC-1999 09:52 * AVERAGE EFFICIENCY: 23.1%  
ELAPSED LIVE TIME: 80003. * RECOVERY: 73.83%  
TRACER ID: PU242_82-76-1 * TRACER FWHM (kev): 22.87  
LAMBDA VALUE: 100. * ROI TYPE: MANUAL  
CORRECTED TRACER DPM: 9.235 * CONFIDENCE LEVEL: 4.65  
SAMPLE MATRIX: MISC * LLD CONSTANT: 2.71  
ENERGY CAL DATE: 3-DEC-1999 06:56 * EFF CAL DATE: 3-DEC-1999 06:56  
BKG FILENAME: B_037_3DEC99 *  
*****
```

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/SA	TPU/ERROR 2-SIGMA	MDC dpm/SA	CRIT LEVEL dpm/SA
PU-238	5487.1	0.60	0.40	99.9	6.321E-02	2.270E-01	5.952E-01	4.403E-01
PU-239	5147.7	6.80	1.20	99.9	7.163E-01	6.148E-01	8.220E-01	5.537E-01
PU242	4890.7	2108.00	2.00	100.4	2.209E+02	1.116E+01	9.733E-01	6.286E-01

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.067 ***

Spectrum : WIZARD\$DKC200: [AHIGH.ALUSR.ARCHIVE.S]S_99126526\$263933_PU.CNF; 2

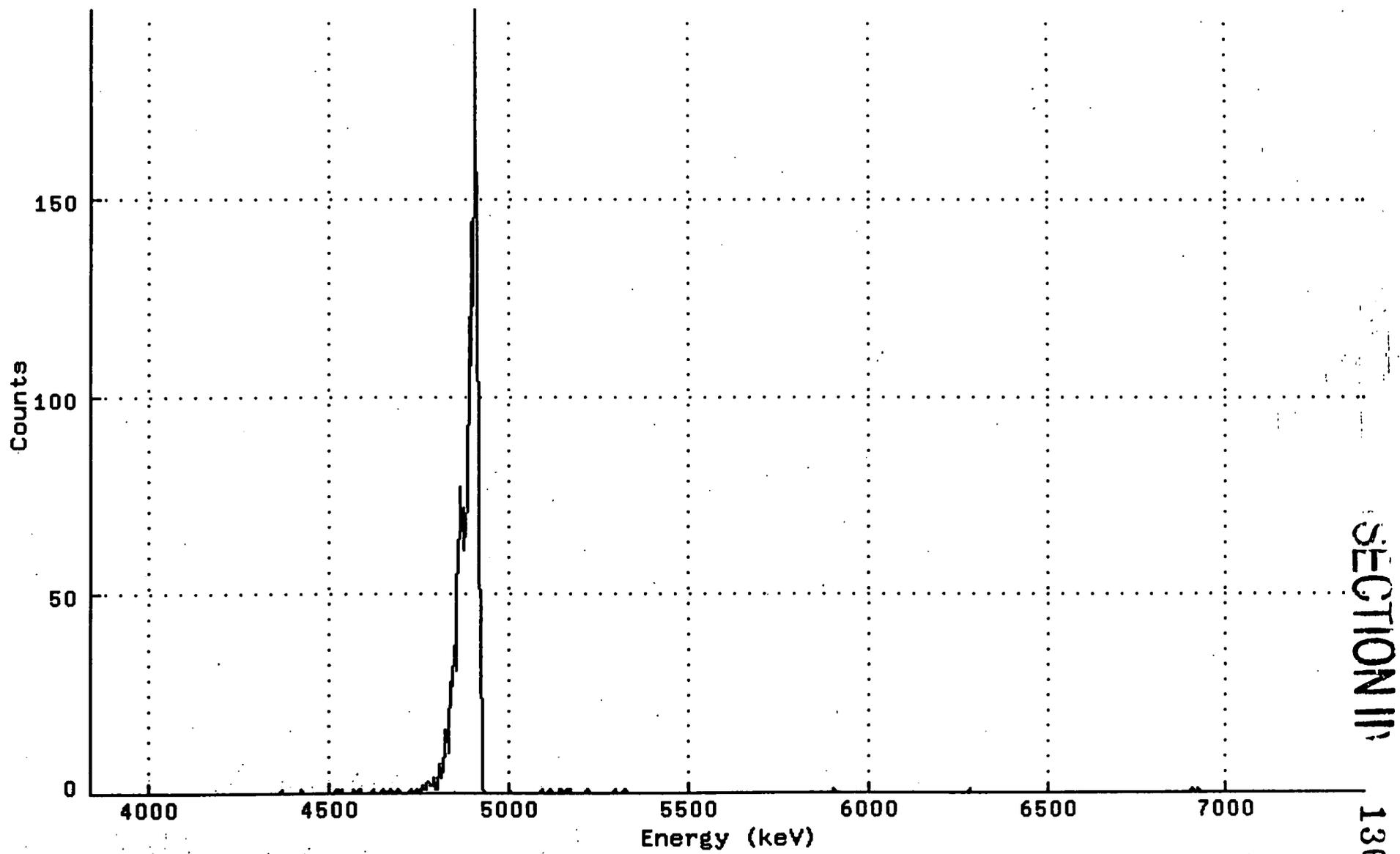
Title : 037

Sample Title:

Start Time: 8-DEC-1999 09:52: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.82918E+03

Real Time : 0 22:13:23.00 Sample ID : 263933 Energy Slope : 3.47146E+00

Live Time : 0 22:13:23.00 Sample Type: PU Energy Quad : 0.00000E+00



308

Spectral File: ND_AMS_ARCHIVE_S:S_99126526\$263934_PU.CNF

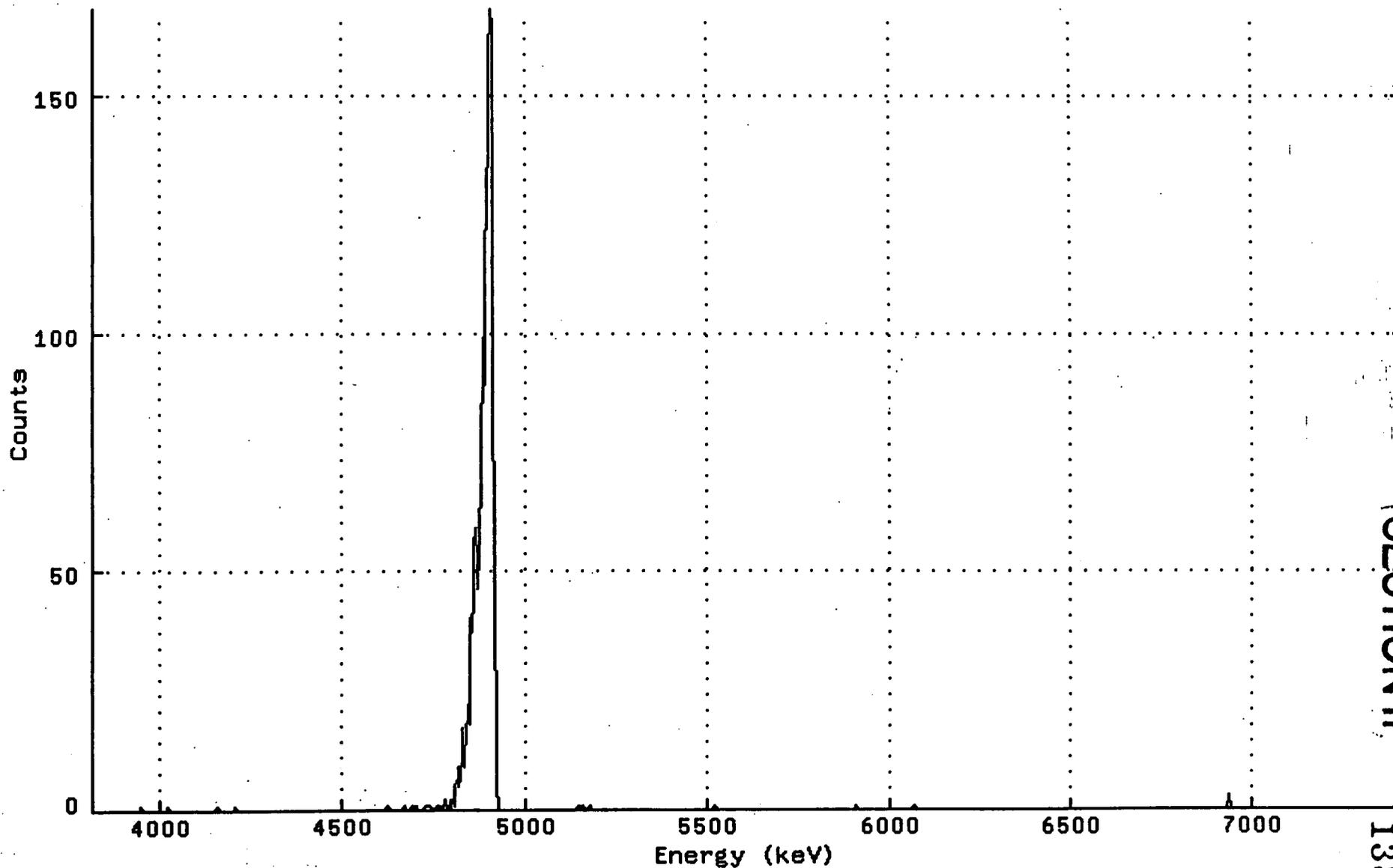
```
*****
BATCH ID:          99126526      *      SAMPLE ID:          263934
SAMPLE DATE:      29-NOV-1999 00:00 *      ALIQUOT:          3.910E-02      SA
SAMPLE TITLE:    *      DETECTOR NUMBER:          038
ACQ DATE:        8-DEC-1999 09:52 *      AVERAGE EFFICIENCY:          23.3%
ELAPSED LIVE TIME: 80003.      *      RECOVERY:          66.55%
TRACER ID:      PU242_82-76-1 *      TRACER FWHM (kev):          30.97
LAMBDA VALUE:    100.      *      ROI TYPE:          STANDARD
CORRECTED TRACER DPM: 9.235      *      CONFIDENCE LEVEL:          4.65
SAMPLE MATRIX:   MISC      *      LLD CONSTANT:          2.71
ENERGY CAL DATE: 3-DEC-1999 06:57 *      EFF CAL DATE:          3-DEC-1999 06:57
BKG FILENAME:    B_038_3DEC99 *
*****
```

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/ SA	TPU/ERROR 2-SIGMA	MDC dpm/ SA	CRIT LEVEL dpm/ SA
PU-238	5487.1	1.00	0.00	99.9	1.241E-01	2.483E-01	3.363E-01	3.363E-01
PU-239	5147.7	2.60	0.40	99.9	3.226E-01	4.416E-01	7.012E-01	5.187E-01
PU242	4890.7	1913.00	0.00	100.4	2.362E+02	1.237E+01	3.346E-01	3.346E-01

*** RECOUNT SAMPLE CL > 0.067 ***

Spectrum : WIZARD\$DKC200: [AHIGH.ALUSR.ARCHIVE.S]S_99126526\$263934_PU.CNF; 2
Title : 038
Sample Title:
Start Time: 8-DEC-1999 09:52: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.80868E+03
Real Time : 0 22:13:23.00 Sample ID : 263934 Energy Slope : 3.49666E+00
Live Time : 0 22:13:23.00 Sample Type: PU Energy Quad : 0.00000E+00



310

(SECTION II)
133

Spectral File: ND_AMS_ARCHIVE_S:S_99126526\$263935_PU.CNF

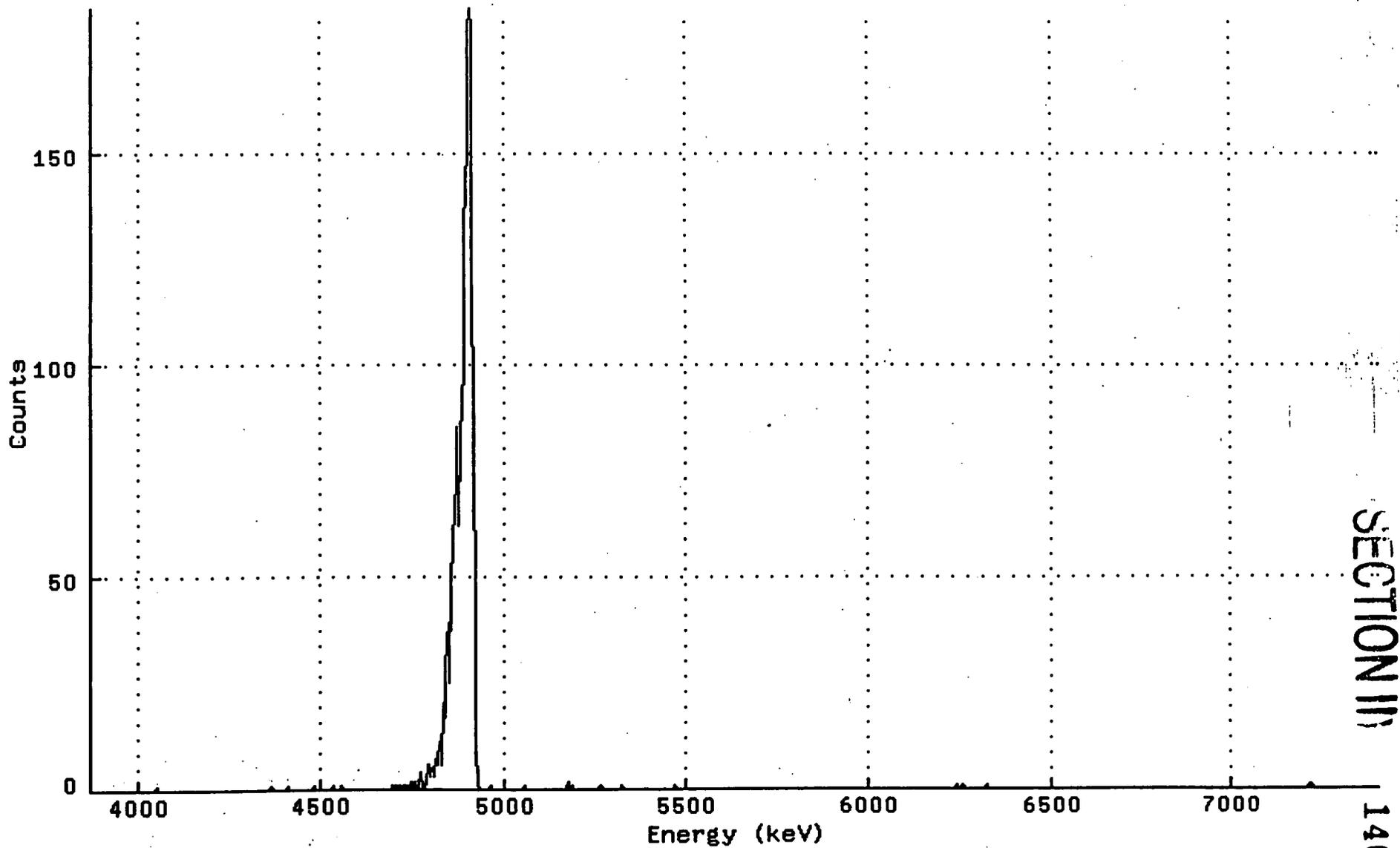
BATCH ID:	99126526	*	SAMPLE ID:	263935
SAMPLE DATE:	29-NOV-1999 00:00	*	ALIQUOT:	3.280E-02 SA
SAMPLE TITLE:		*	DETECTOR NUMBER:	039
ACQ DATE:	8-DEC-1999 09:53	*	AVERAGE EFFICIENCY:	23.3%
ELAPSED LIVE TIME:	80007.	*	RECOVERY:	78.59%
TRACER ID:	PU242_82-76-1	*	TRACER FWHM (kev):	29.52
LAMBDA VALUE:	100.	*	ROI TYPE:	STANDARD
CORRECTED TRACER DPM:	9.235	*	CONFIDENCE LEVEL:	4.65
SAMPLE MATRIX:	MISC	*	LLD CONSTANT:	2.71
ENERGY CAL DATE:	3-DEC-1999 06:59	*	EFF CAL DATE:	3-DEC-1999 06:59
BKG FILENAME:	B_039_3DEC99	•		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/SA	TPU/ERROR 2-SIGMA	MDC dpm/SA	CRIT LEVEL dpm/SA
PU-238	5487.1	0.20	0.80	99.9	2.496E-02	2.868E-01	8.573E-01	5.977E-01
PU-239	5147.7	1.20	2.80	99.9	1.497E-01	5.648E-01	1.309E+00	8.237E-01
PU242	4890.7	2267.40	1.60	100.4	2.816E+02	1.386E+01	1.067E+00	7.017E-01

*** RECOUNT SAMPLE CL > 0.067 ***

Spectrum : WIZARD\$DKC200: [AHIGH.ALUSR.ARCHIVE.S]S_99126526\$263935_PU.CNF; 2
Title : 039
Sample Title:
Start Time: 8-DEC-1999 09:53: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.86215E+03
Real Time : 0 22:13:27.00 Sample ID : 263935 Energy Slope : 3.45693E+00
Live Time : 0 22:13:27.00 Sample Type: PU Energy Quad : 0.00000E+00



Spectral File: ND_AMS_ARCHIVE_S:S_99126526\$263936_PU.CNF

```

*****
BATCH ID:          99126526      *      SAMPLE ID:          263936
SAMPLE DATE:      29-NOV-1999 00:00 *      ALIQUOT:          4.530E-02 SA
SAMPLE TITLE:    *      DETECTOR NUMBER:        040
ACQ DATE:        8-DEC-1999 09:53 *      AVERAGE EFFICIENCY: 23.9%
ELAPSED LIVE TIME: 80003.      *      RECOVERY:          59.96%
TRACER ID:      PU242_82-76-1 *      TRACER FWHM (kev): 25.57
LAMBDA VALUE:    100.          *      ROI TYPE:          STANDARD
CORRECTED TRACER DPM: 9.235    *      CONFIDENCE LEVEL: 4.65
SAMPLE MATRIX:   MISC          *      LLD CONSTANT:     2.71
ENERGY CAL DATE: 3-DEC-1999 07:00 *      EFF CAL DATE:     3-DEC-1999 07:00
BKG FILENAME:    B_040_3DEC99  *
*****

```

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/	TPU/ERROR SA 2-SIGMA	MDC dpm/	CRIT LEVEL SA dpm/
PU-238	5487.1	0.40	1.60	99.9	4.634E-02	3.765E-01	9.952E-01	6.546E-01
PU-239	5147.7	-0.60	1.60	99.9	-6.950E-02	2.967E-01	9.952E-01	6.546E-01
PU242	4890.7	1768.80	1.20	100.4	2.039E+02	1.102E+01	8.994E-01	6.059E-01

*** RECOUNT SAMPLE CL > 0.067 ***

Spectrum : WIZARD\$DKC200: [AHIGH.ALUSR.ARCHIVE.S]S_99126526\$263936_PU.CNF; 2

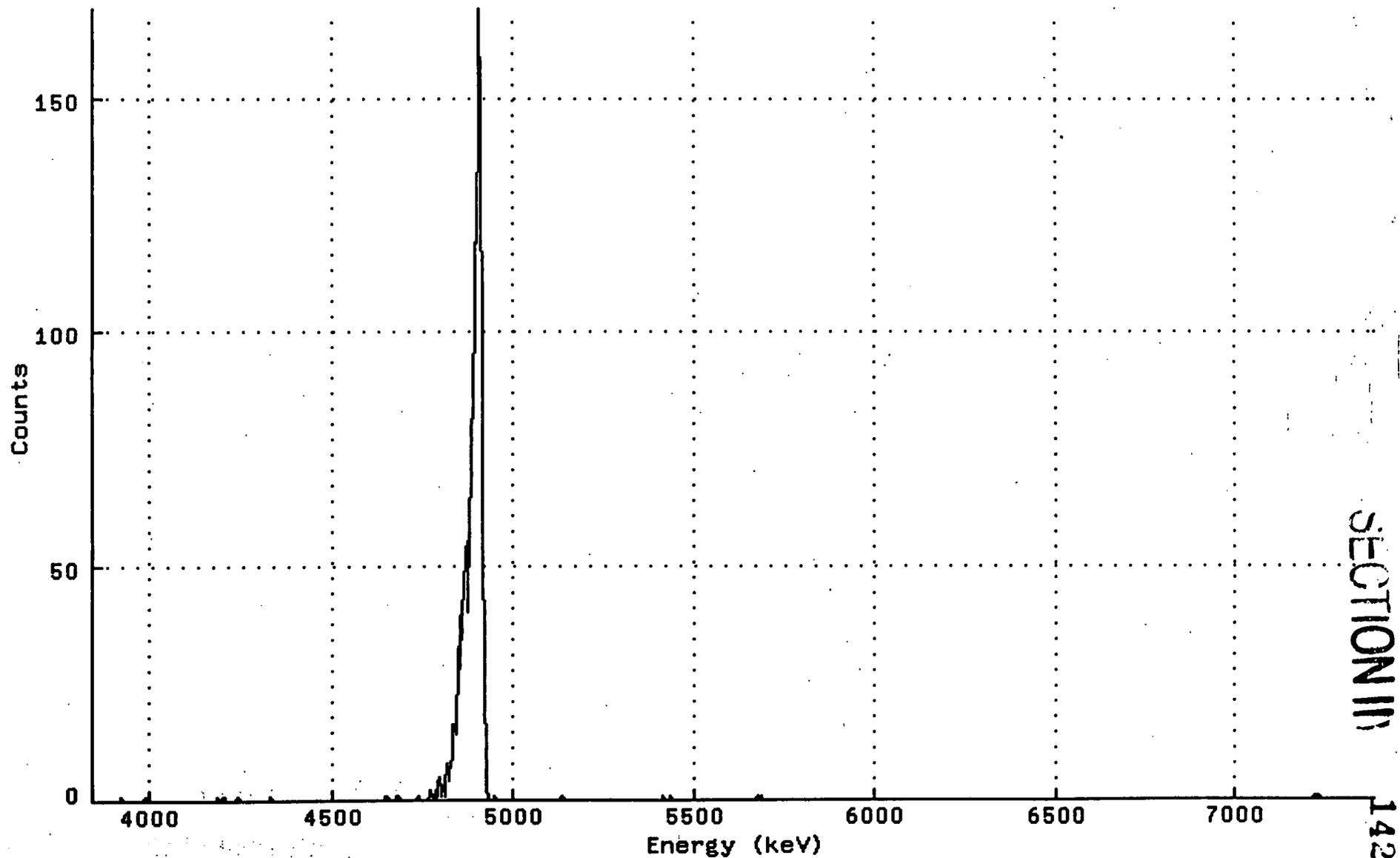
Title : 040

Sample Title:

Start Time: 8-DEC-1999 09:53: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.83148E+03

Real Time : 0 22:13:23.00 Sample ID : 263936 Energy Slope : 3.46978E+00

Live Time : 0 22:13:23.00 Sample Type: PU Energy Quad : 0.00000E+00



314

Spectral File: ND_AMS_ARCHIVE_S:S_99126526\$263937_PU.CNF

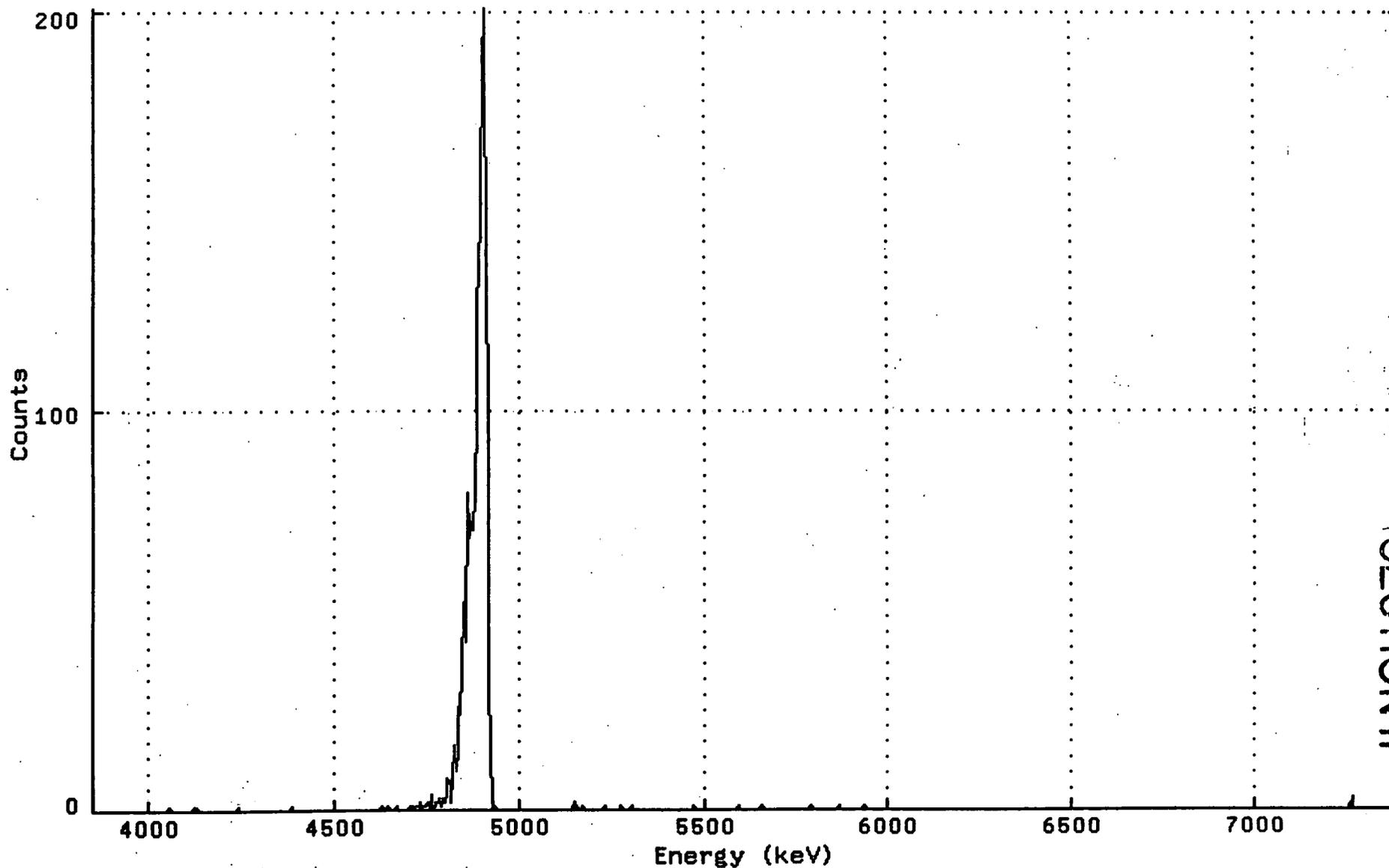
```
*****
BATCH ID:          99126526      *      SAMPLE ID:          263937
SAMPLE DATE:      29-NOV-1999 00:00 *      ALIQUOT:          3.890E-02 SA
SAMPLE TITLE:          *      DETECTOR NUMBER:      041
ACQ DATE:         8-DEC-1999 09:53 *      AVERAGE EFFICIENCY: 23.1%
ELAPSED LIVE TIME: 80006.        *      RECOVERY:          84.13%
TRACER ID:        PU242_82-76-1 *      TRACER FWHM (kev): 30.47
LAMBDA VALUE:     100.           *      ROI TYPE:          STANDARD
CORRECTED TRACER DPM: 9.235      *      CONFIDENCE LEVEL:  4.65
SAMPLE MATRIX:    MISC           *      LLD CONSTANT:      2.71
ENERGY CAL DATE:  3-DEC-1999 07:05 *      EFF CAL DATE:      3-DEC-1999 07:05
BKG FILENAME:     B_041_3DEC99  *
*****
```

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/SA	TPU/ERROR 2-SIGMA	MDC dpm/SA	CRIT LEVEL dpm/SA
PU-238	5487.1	0.60	0.40	99.9	5.966E-02	2.142E-01	5.618E-01	4.156E-01
PU-239	5147.7	2.00	2.00	99.9	1.988E-01	4.358E-01	9.233E-01	5.963E-01
PU242	4890.7	2399.80	1.20	100.4	2.374E+02	1.145E+01	7.720E-01	5.201E-01

*** RECOUNT SAMPLE CL > 0.067 ***

Spectrum : WIZARD\$DKC200: [AHIGH.ALUSR.ARCHIVE.S]S_99126526\$263937_PU.CNF; 2
Title : 041
Sample Title:
Start Time: 8-DEC-1999 09:53: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.83753E+03
Real Time : 0 22:13:26.00 Sample ID : 263937 Energy Slope : 3.45395E+00
Live Time : 0 22:13:26.00 Sample Type: PU Energy Quad : 0.00000E+00



316

(SECTION II)
144

Spectral File: ND_AMS_ARCHIVE_S:S_99126526\$263938_PU.CNF

```
*****
BATCH ID:          99126526      *      SAMPLE ID:          263938
SAMPLE DATE:      29-NOV-1999 00:00 *      ALIQUOT:          6.360E-02      SA
SAMPLE TITLE:          *      DETECTOR NUMBER:          042
ACQ DATE:          8-DEC-1999 09:53 *      AVERAGE EFFICIENCY:          23.6%
ELAPSED LIVE TIME:      80000.    *      RECOVERY:          85.59%
TRACER ID:          PU242_82-76-1 *      TRACER FWHM (kev):          34.56
LAMBDA VALUE:          100.        *      ROI TYPE:          MANUAL
CORRECTED TRACER DPM:      9.235   *      CONFIDENCE LEVEL:          4.65
SAMPLE MATRIX:          MISC        *      LLD CONSTANT:          2.71
ENERGY CAL DATE:      3-DEC-1999 07:08 *      EFF CAL DATE:          3-DEC-1999 07:08
BKG FILENAME:          B_042_3DEC99 *
*****
```

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/	TPU/ERROR SA 2-SIGMA	MDC dpm/	CRIT LEVEL SA dpm/
PU-238	5487.1	-0.20	1.20	99.9	-1.170E-02	1.424E-01	4.565E-01	3.075E-01
PU-239	5147.7	3.00	0.00	99.9	1.755E-01	2.029E-01	1.585E-01	1.585E-01
PU242	4890.7	2494.80	1.20	100.4	1.452E+02	6.903E+00	4.542E-01	3.060E-01

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.067 ***

Spectrum : WIZARD\$DKC200: [AHIGH.ALUSR.ARCHIVE.S]S_99126526\$263938_PU.CNF; 2

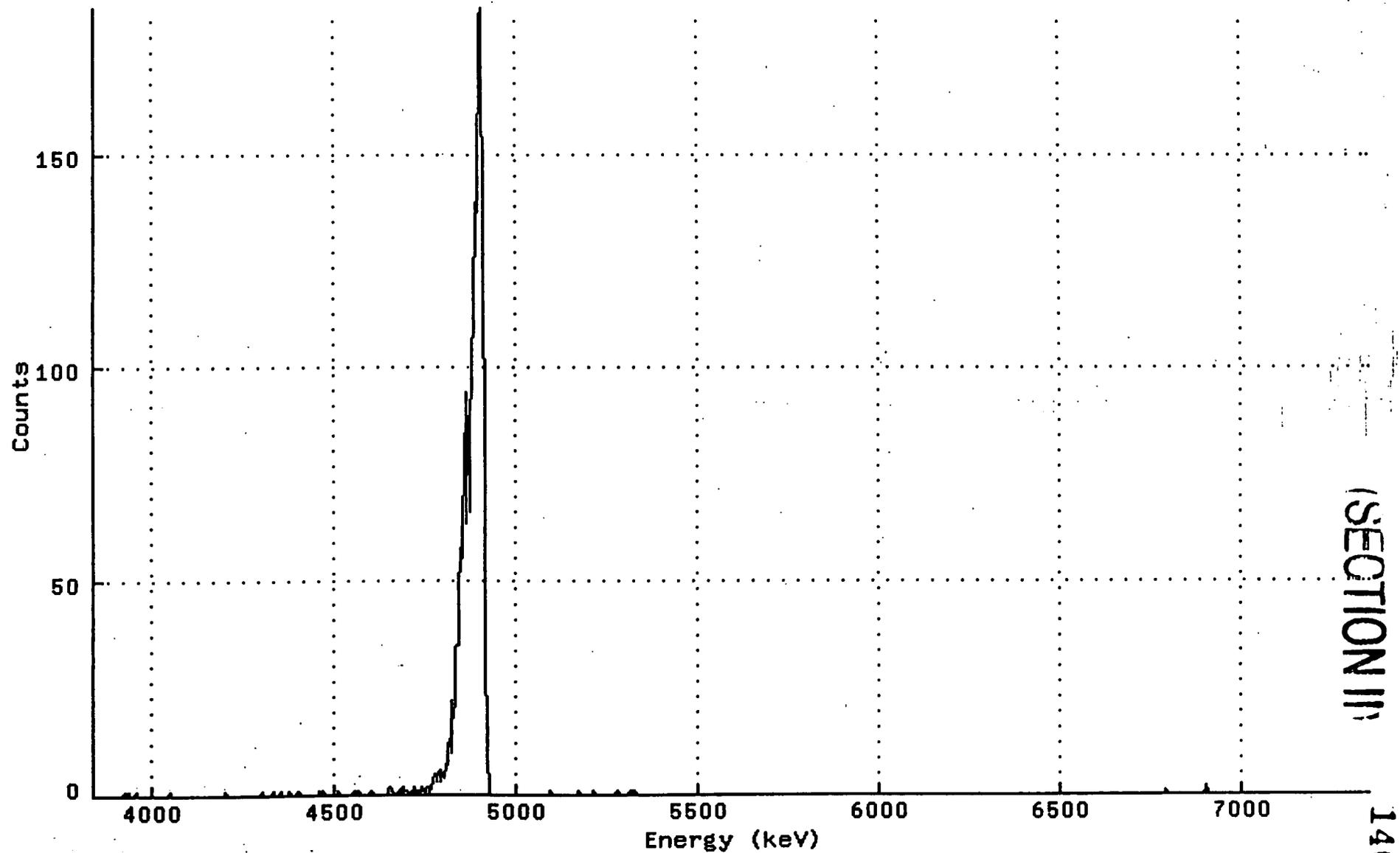
Title : 042

Sample Title:

Start Time: 8-DEC-1999 09:53: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.83215E+03

Real Time : 0 22:13:20.00 Sample ID : 263938 Energy Slope : 3.43781E+00

Live Time : 0 22:13:20.00 Sample Type: PU Energy Quad : 0.00000E+00



3/8

Spectral File: ND_AMS_ARCHIVE_S:S_99126526\$263939_PU.CNF

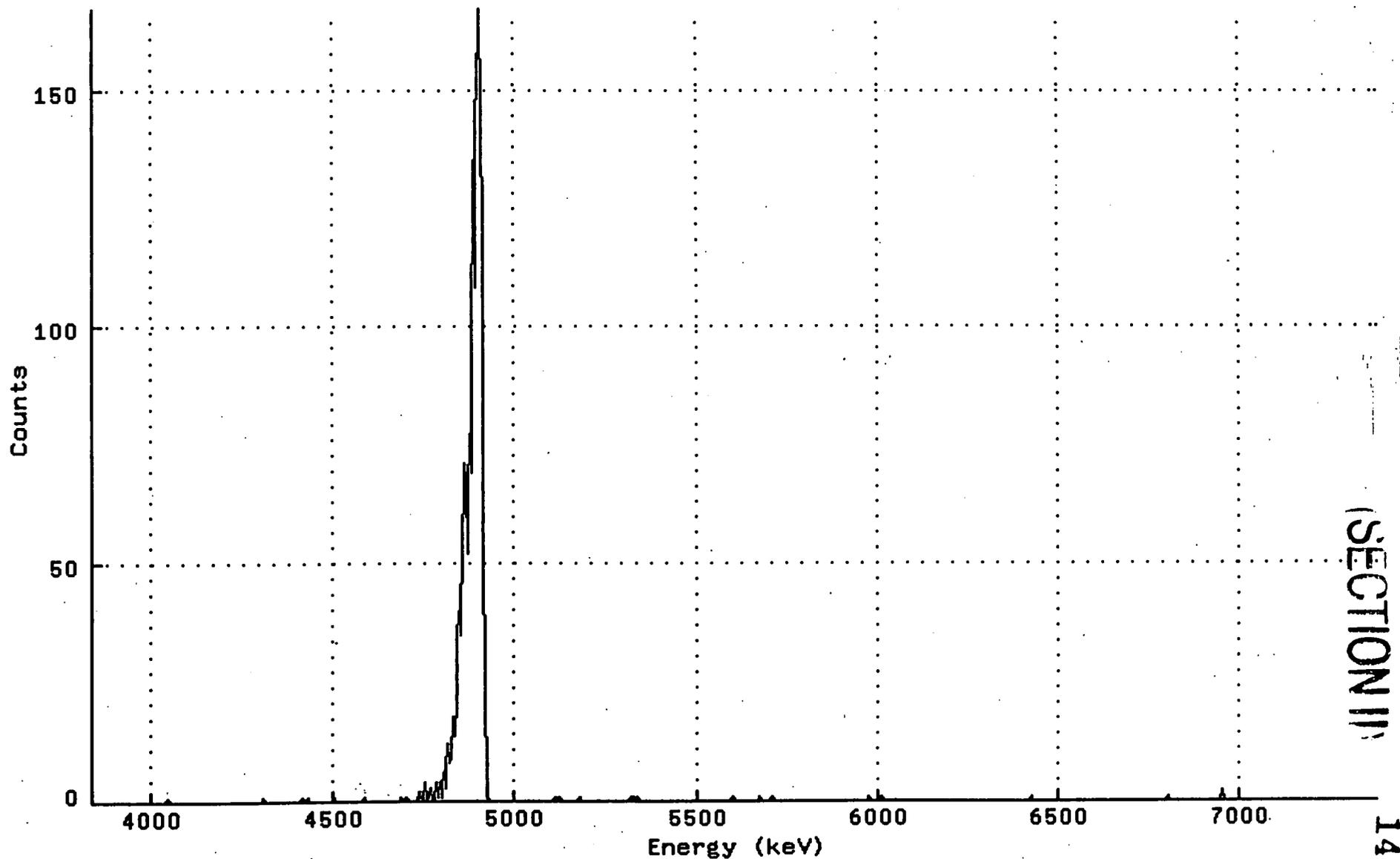
BATCH ID:	99126526	*	SAMPLE ID:	263939
SAMPLE DATE:	29-NOV-1999 00:00	*	ALIQOT:	4.610E-02 SA
SAMPLE TITLE:		*	DETECTOR NUMBER:	043
ACQ DATE:	8-DEC-1999 09:54	*	AVERAGE EFFICIENCY:	23.1%
ELAPSED LIVE TIME:	80008.	*	RECOVERY:	74.33%
TRACER ID:	PU242_82-76-1	*	TRACER FWHM (kev):	30.61
LAMBDA VALUE:	100.	*	ROI TYPE:	MANUAL
CORRECTED TRACER DPM:	9.235	•	CONFIDENCE LEVEL:	4.65
SAMPLE MATRIX:	MISC	*	LLD CONSTANT:	2.71
ENERGY CAL DATE:	3-DEC-1999 07:10	*	EFF CAL DATE:	3-DEC-1999 07:10
BKG FILENAME:	B_043_3DEC99	*		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/SA	TPU/ERROR 2-SIGMA	MDC dpm/SA	CRIT LEVEL dpm/SA
PU-238	5487.1	0.60	0.40	99.9	5.688E-02	2.043E-01	5.357E-01	3.963E-01
PU-239	5147.7	0.20	2.80	99.9	1.893E-02	3.848E-01	9.944E-01	6.257E-01
PU242	4890.7	2124.00	2.00	100.4	2.003E+02	1.010E+01	8.759E-01	5.657E-01

*** RECOUNT SAMPLE CL > 0.067 ***

Spectrum : WIZARD\$DKC200: [AHIGH.ALUSR.ARCHIVE.S]S_99126526\$263939_PU.CNF; 1
Title : 043
Sample Title:
Start Time: 8-DEC-1999 09:54: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.83028E+03
Real Time : 0 22:13:28.00 Sample ID : 263939 Energy Slope : 3.46730E+00
Live Time : 0 22:13:28.00 Sample Type: PU Energy Quad : 0.00000E+00



320

Spectral File: ND_AMS_ARCHIVE_S:S_99126526\$263940_PU.CNF

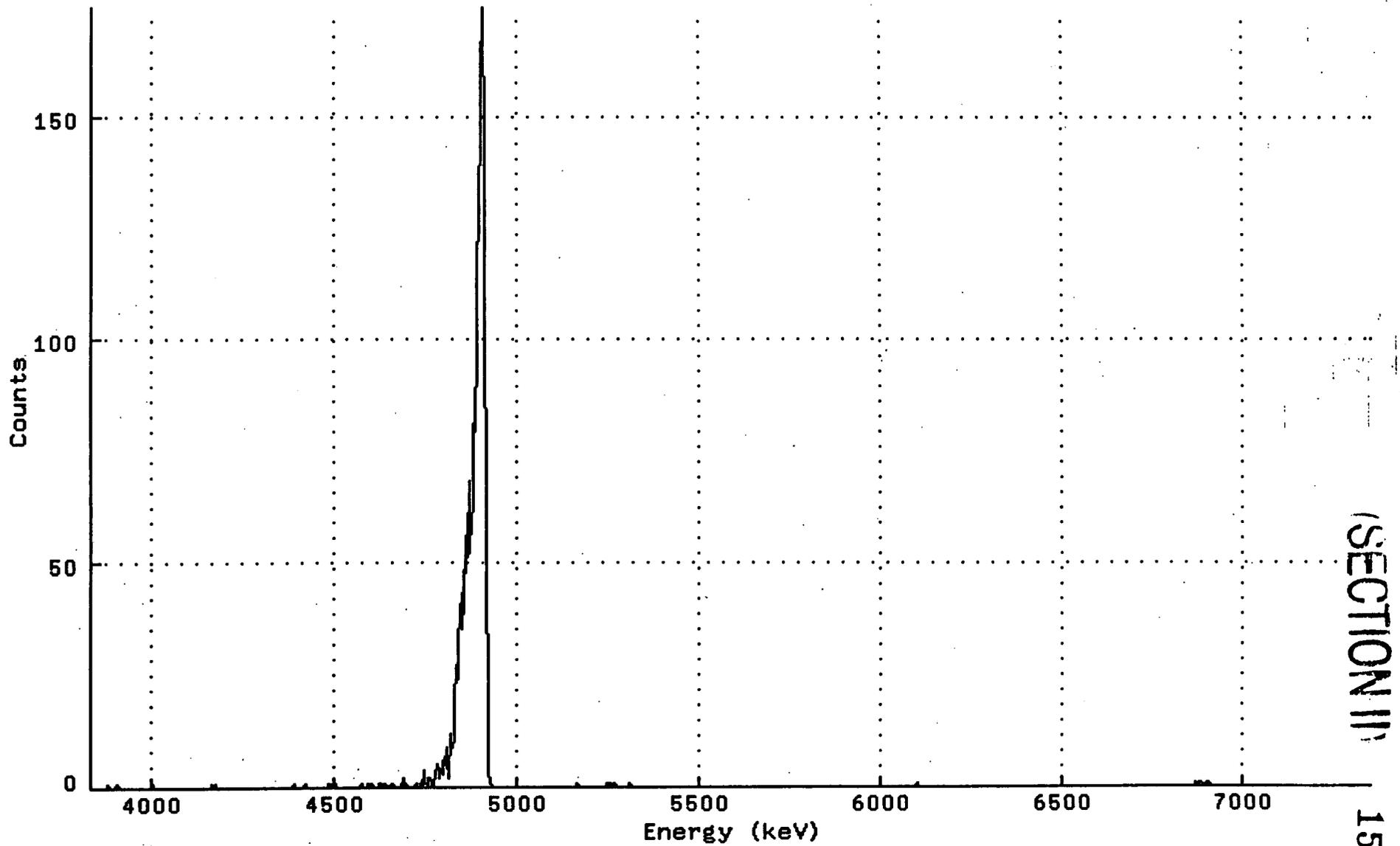
```
*****
*
* BATCH ID: 99126526 * SAMPLE ID: 263940
* SAMPLE DATE: 29-NOV-1999 00:00 * ALIQUOT: 6.670E-02 SA
* SAMPLE TITLE: * DETECTOR NUMBER: 044
* ACQ DATE: 8-DEC-1999 09:54 * AVERAGE EFFICIENCY: 22.8%
* ELAPSED LIVE TIME: 80003. * RECOVERY: 73.31%
* TRACER ID: PU242_82-76-1 * TRACER FWHM (kev): 27.66
* LAMBDA VALUE: 100. * ROI TYPE: STANDARD
* CORRECTED TRACER DPM: 9.235 * CONFIDENCE LEVEL: 4.65
* SAMPLE MATRIX: MISC * LLD CONSTANT: 2.71
* ENERGY CAL DATE: 3-DEC-1999 07:11 * EFF CAL DATE: 3-DEC-1999 07:11
* BKG FILENAME: B_044_3DEC99 *
*
*****
```

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/	TPU/ERROR SA 2-SIGMA	MDC dpm/	CRIT LEVEL SA dpm/
U-238	5487.1	-0.40	0.40	99.9	-2.695E-02	5.393E-02	3.807E-01	2.816E-01
U-239	5147.7	-0.60	1.60	99.9	-4.042E-02	1.726E-01	5.788E-01	3.807E-01
PU242	4890.7	2065.60	0.40	100.4	1.385E+02	7.055E+00	3.788E-01	2.802E-01

*** RECOUNT SAMPLE CL > 0.067 ***

Spectrum : WIZARD\$DKC200: [AHIGH.ALUSR.ARCHIVE.S]S_99126526\$263940_PU.CNF; 1
Title : 044
Sample Title:
Start Time: 8-DEC-1999 09:54: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.82640E+03
Real Time : 0 22:13:23.00 Sample ID : 263940 Energy Slope : 3.44100E+00
Live Time : 0 22:13:23.00 Sample Type: PU Energy Quad : 0.00000E+00



322

Spectral File: ND_AMS_ARCHIVE_S:S_99126526\$263941_PU.CNF

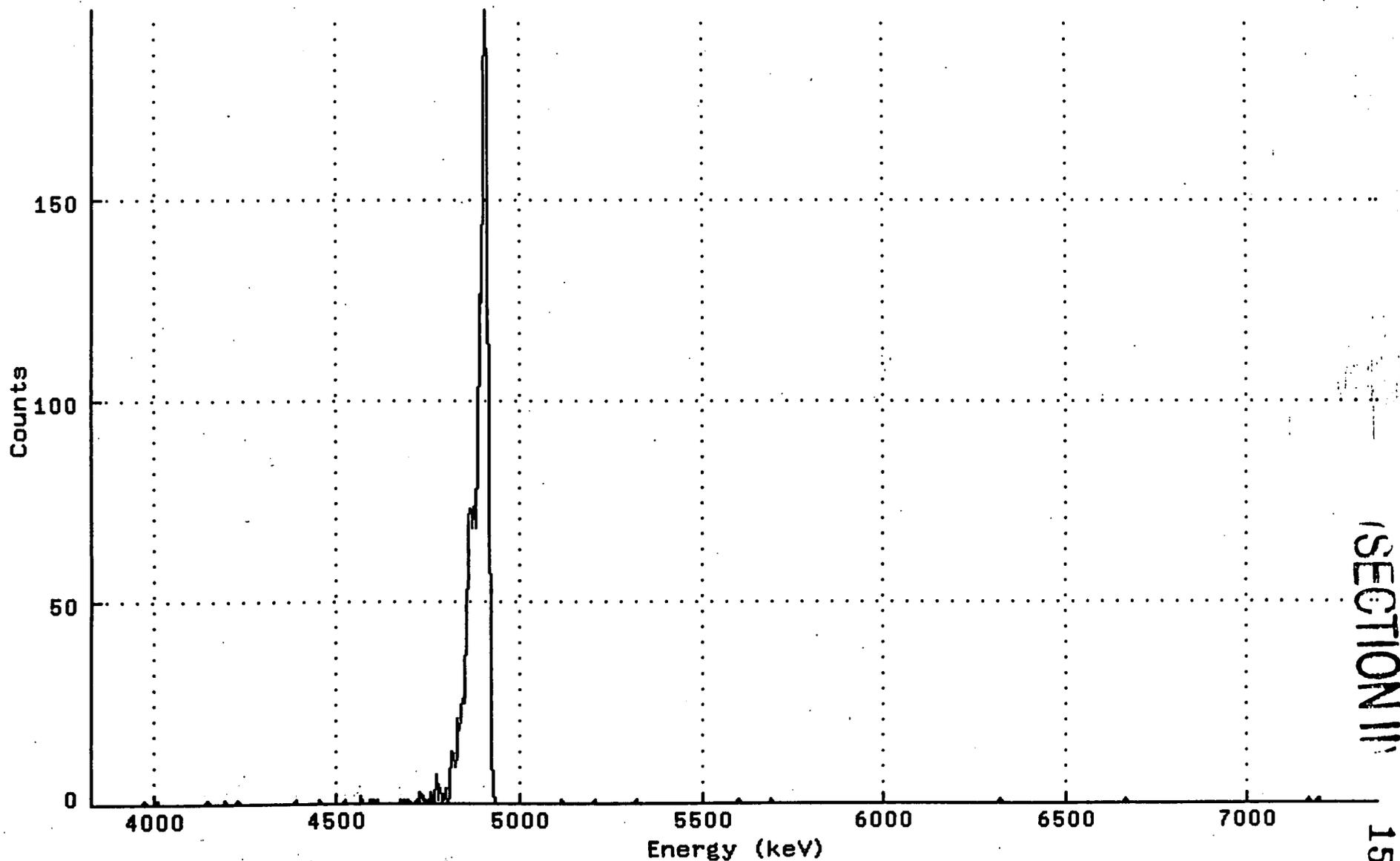
```
*****
BATCH ID:          99126526      *      SAMPLE ID:          263941
SAMPLE DATE:      29-NOV-1999 00:00 *      ALIQUOT:          3.760E-02 SA
SAMPLE TITLE:          *      DETECTOR NUMBER:      045
ACQ DATE:         8-DEC-1999 09:54 *      AVERAGE EFFICIENCY: 23.5%
ELAPSED LIVE TIME: 80005.        *      RECOVERY:          79.09%
TRACER ID:        PU242_82-76-1 *      TRACER FWHM (kev):  28.82
LAMBDA VALUE:     100.           *      ROI TYPE:          MANUAL
CORRECTED TRACER DPM: 9.235      *      CONFIDENCE LEVEL:  4.65
SAMPLE MATRIX:    MISC           *      LLD CONSTANT:      2.71
ENERGY CAL DATE:  3-DEC-1999 07:13 *      EFF CAL DATE:      3-DEC-1999 07:13
BKG FILENAME:     B_045_3DEC99  *
*****
```

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/SA	TPU/ERROR 2-SIGMA	MDC dpm/SA	CRIT LEVEL dpm/SA
PU-238	5487.1	0.20	0.80	99.9	2.147E-02	2.467E-01	7.373E-01	5.141E-01
PU-239	5147.7	0.40	1.60	99.9	4.293E-02	3.488E-01	9.223E-01	6.066E-01
PU242	4890.7	2299.60	0.40	100.4	2.456E+02	1.200E+01	6.036E-01	4.465E-01

*** RECOUNT SAMPLE CL > 0.067 ***

Spectrum : WIZARD\$DKC200: [AHIGH.ALUSR.ARCHIVE.S]S_99126526\$263941_PU.CNF; 1
Title : 045
Sample Title:
Start Time: 8-DEC-1999 09:54: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.82089E+03
Real Time : 0 22:13:25.00 Sample ID : 263941 Energy Slope : 3.45370E+00
Live Time : 0 22:13:25.00 Sample Type: PU Energy Quad : 0.00000E+00



324

Spectral File: ND_AMS_ARCHIVE_S:S_99126526\$263942_PU.CNF

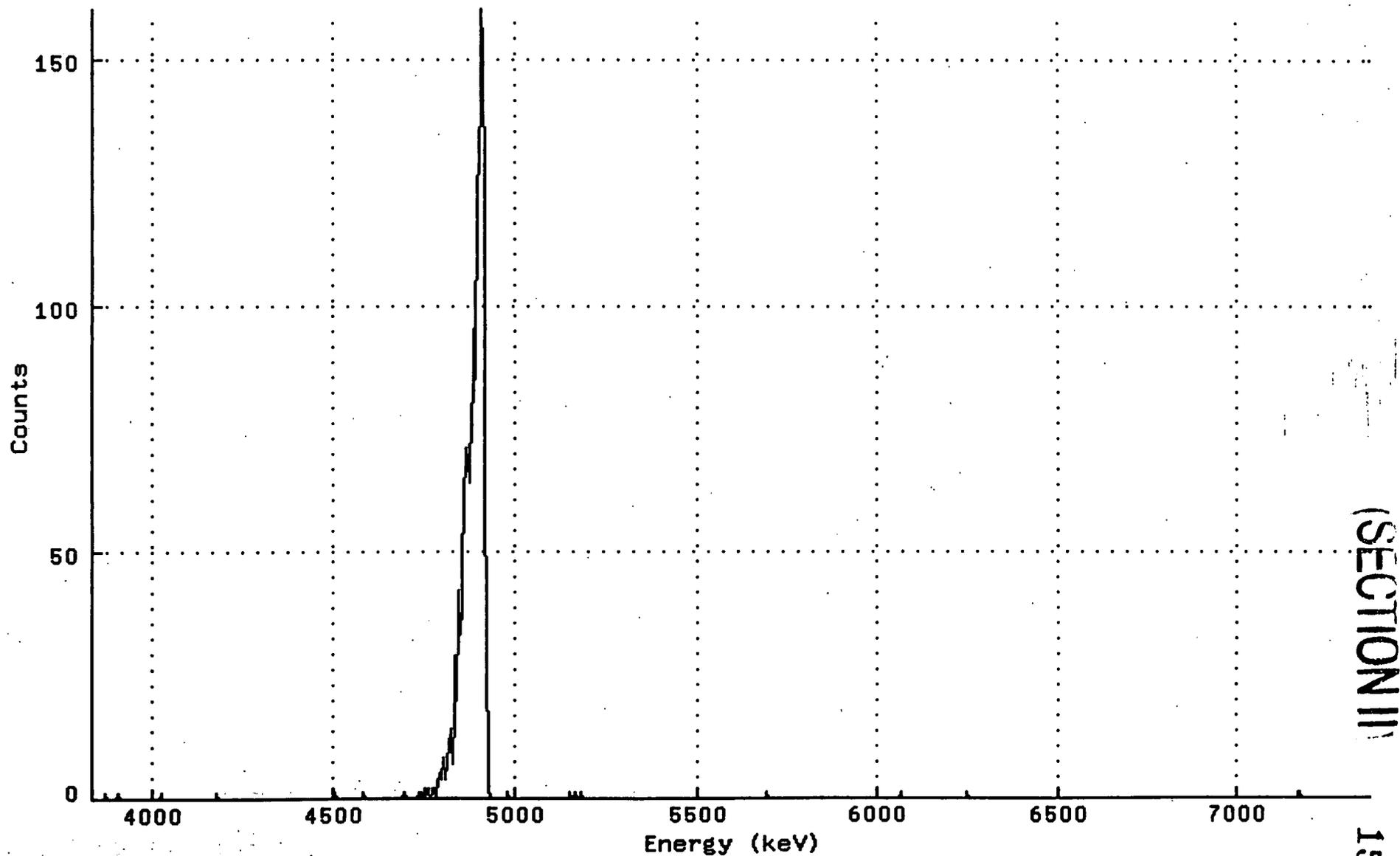
BATCH ID:	99126526	*	SAMPLE ID:	263942
SAMPLE DATE:	29-NOV-1999 00:00	*	ALIQUOT:	3.730E-02 SA
SAMPLE TITLE:		*	DETECTOR NUMBER:	046
ACQ DATE:	8-DEC-1999 09:54	*	AVERAGE EFFICIENCY:	23.6%
ELAPSED LIVE TIME:	80006.	*	RECOVERY:	74.03%
TRACER ID:	PU242_82-76-1	*	TRACER FWHM (kev):	35.56
LAMBDA VALUE:	100.	*	ROI TYPE:	EXPANDED
CORRECTED TRACER DPM:	9.235	*	CONFIDENCE LEVEL:	4.65
SAMPLE MATRIX:	MISC	*	LLD CONSTANT:	2.71
ENERGY CAL DATE:	3-DEC-1999 07:14	*	EFF CAL DATE:	3-DEC-1999 07:14
BKG FILENAME:	B_046_3DEC99	*		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/	TPU/ERROR SA 2-SIGMA	MDC dpm/	CRIT LEVEL SA dpm/	LEVEL SA
U-238	5487.1	-1.20	1.20	99.9	-1.380E-01	1.595E-01	8.973E-01	6.044E-01	
U-239	5147.7	1.40	1.60	99.9	1.610E-01	4.388E-01	9.879E-01	6.497E-01	
PU242	4890.7	2164.20	0.80	100.4	2.476E+02	1.239E+01	7.858E-01	5.479E-01	

*** RECOUNT SAMPLE CL > 0.067 ***

Spectrum : WIZARD\$DKC200: [AHIGH.ALUSR.ARCHIVE.S]S_99126526\$263942_PU.CNF; 1
Title : 046
Sample Title:
Start Time: 8-DEC-1999 09:54: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.82498E+03
Real Time : 0 22:13:26.00 Sample ID : 263942 Energy Slope : 3.45799E+00
Live Time : 0 22:13:26.00 Sample Type: PU Energy Quad : 0.00000E+00



326

(SECTION II)
154

Spectral File: ND_AMS_ARCHIVE_S:S_99126526\$263943_PU.CNF

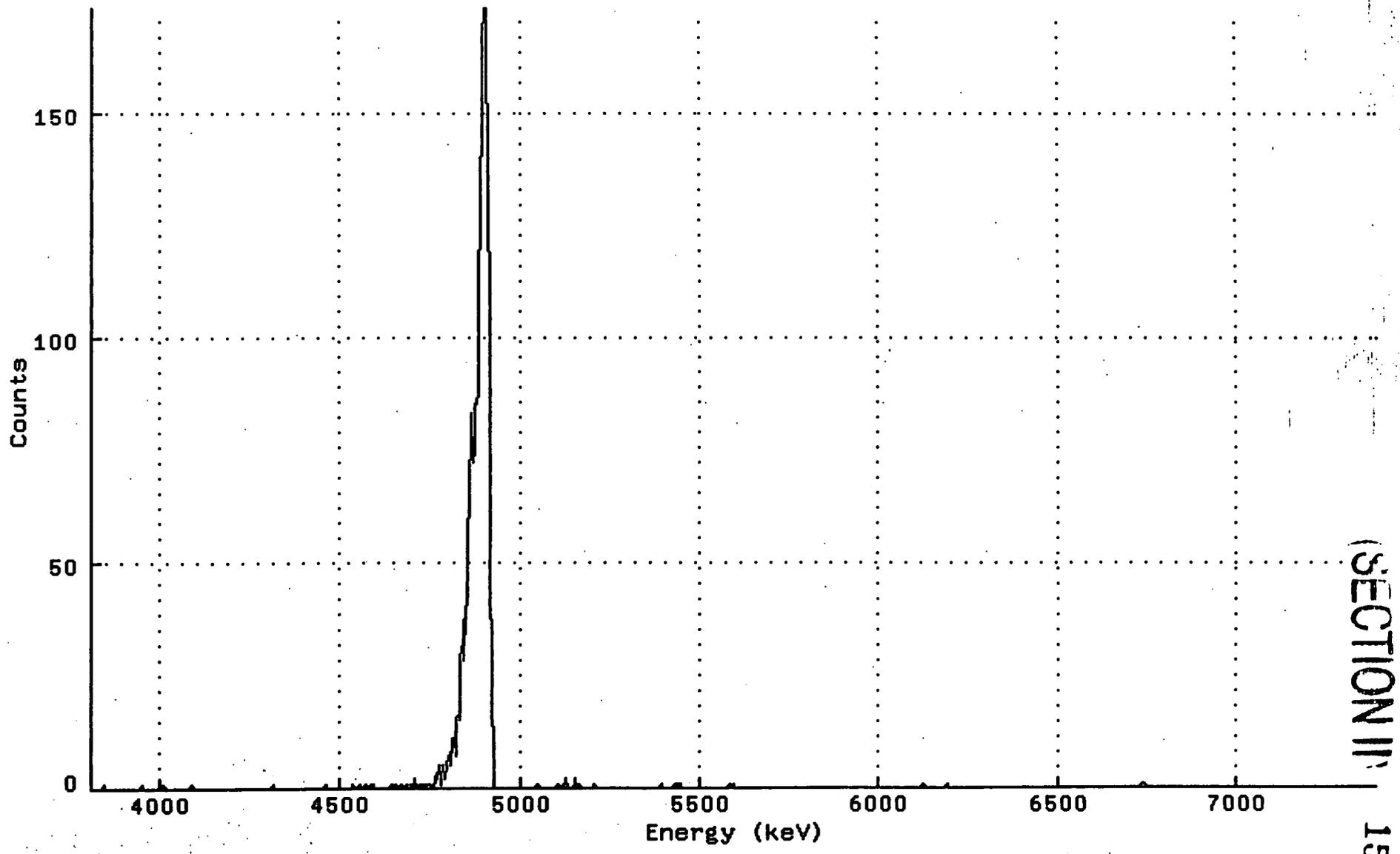
BATCH ID:	99126526	*	SAMPLE ID:	263943
SAMPLE DATE:	29-NOV-1999 00:00	*	ALIQOT:	5.230E-02 SA
SAMPLE TITLE:		*	DETECTOR NUMBER:	047
ACQ DATE:	8-DEC-1999 09:54	*	AVERAGE EFFICIENCY:	23.3%
ELAPSED LIVE TIME:	80005.	*	RECOVERY:	83.11%
TRACER ID:	PU242_82-76-1	*	TRACER FWHM (kev):	33.94
LAMBDA VALUE:	100.	*	ROI TYPE:	STANDARD
CORRECTED TRACER DPM:	9.235	*	CONFIDENCE LEVEL:	4.65
SAMPLE MATRIX:	MISC	*	LLD CONSTANT:	2.71
ENERGY CAL DATE:	3-DEC-1999 07:15	*	EFF CAL DATE:	3-DEC-1999 07:15
BKG FILENAME:	B_047_3DEC99	*		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/	TPU/ERROR SA 2-SIGMA	MDC dpm/	CRIT LEVEL SA dpm/
U-238	5487.1	3.80	1.20	99.9	2.816E-01	3.472E-01	5.781E-01	3.894E-01
U-239	5147.7	8.60	0.40	99.9	6.371E-01	4.497E-01	4.186E-01	3.097E-01
PU242	4890.7	2395.60	0.40	100.4	1.766E+02	8.511E+00	4.165E-01	3.081E-01

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.067 ***

Spectrum : WIZARD\$DKC200: [AHIGH.ALUSR.ARCHIVE.S]S_99126526\$263943_PU.CNF; 1
Title : 047
Sample Title:
Start Time: 8-DEC-1999 09:54: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.79994E+03
Real Time : 0 22:13:25.00 Sample ID : 263943 Energy Slope : 3.50515E+00
Live Time : 0 22:13:25.00 Sample Type: PU Energy Quad : 0.00000E+00



328

 Spectral File: ND_AMS_ARCHIVE_S:S_99126526\$263944_PU.CNF

BATCH ID:	99126526	*	SAMPLE ID:	263944
SAMPLE DATE:	29-NOV-1999 00:00	*	ALIQUOT:	3.240E-02 SA
SAMPLE TITLE:		*	DETECTOR NUMBER:	048
ACQ DATE:	8-DEC-1999 09:55	*	AVERAGE EFFICIENCY:	22.7%
ELAPSED LIVE TIME:	80003.	*	RECOVERY:	65.75%
TRACER ID:	PU242_82-76-1	*	TRACER FWHM (kev):	30.15
LAMBDA VALUE:	100.	*	ROI TYPE:	STANDARD
CORRECTED TRACER DPM:	9.235	*	CONFIDENCE LEVEL:	4.65
SAMPLE MATRIX:	MISC	*	LLD CONSTANT:	2.71
ENERGY CAL DATE:	3-DEC-1999 07:17	*	EFF CAL DATE:	3-DEC-1999 07:17
BKG FILENAME:	B_048_3DEC99	*		

 NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/	TPU/ERROR SA 2-SIGMA	MDC dpm/	CRIT LEVEL SA dpm/
PU-238	5487.1	1.60	0.40	99.9	2.482E-01	4.562E-01	8.763E-01	6.483E-01
PU-239	5147.7	-0.20	1.20	99.9	-3.102E-02	3.773E-01	1.210E+00	8.152E-01
PU242	4890.7	1847.20	0.80	100.4	2.850E+02	1.514E+01	1.060E+00	7.391E-01

 *** RECOUNT SAMPLE CL > 0.067 ***

Spectrum : WIZARD\$DKC200: [AHIGH.ALUSR.ARCHIVE.S]S_99126526\$263944_PU.CNF; 1

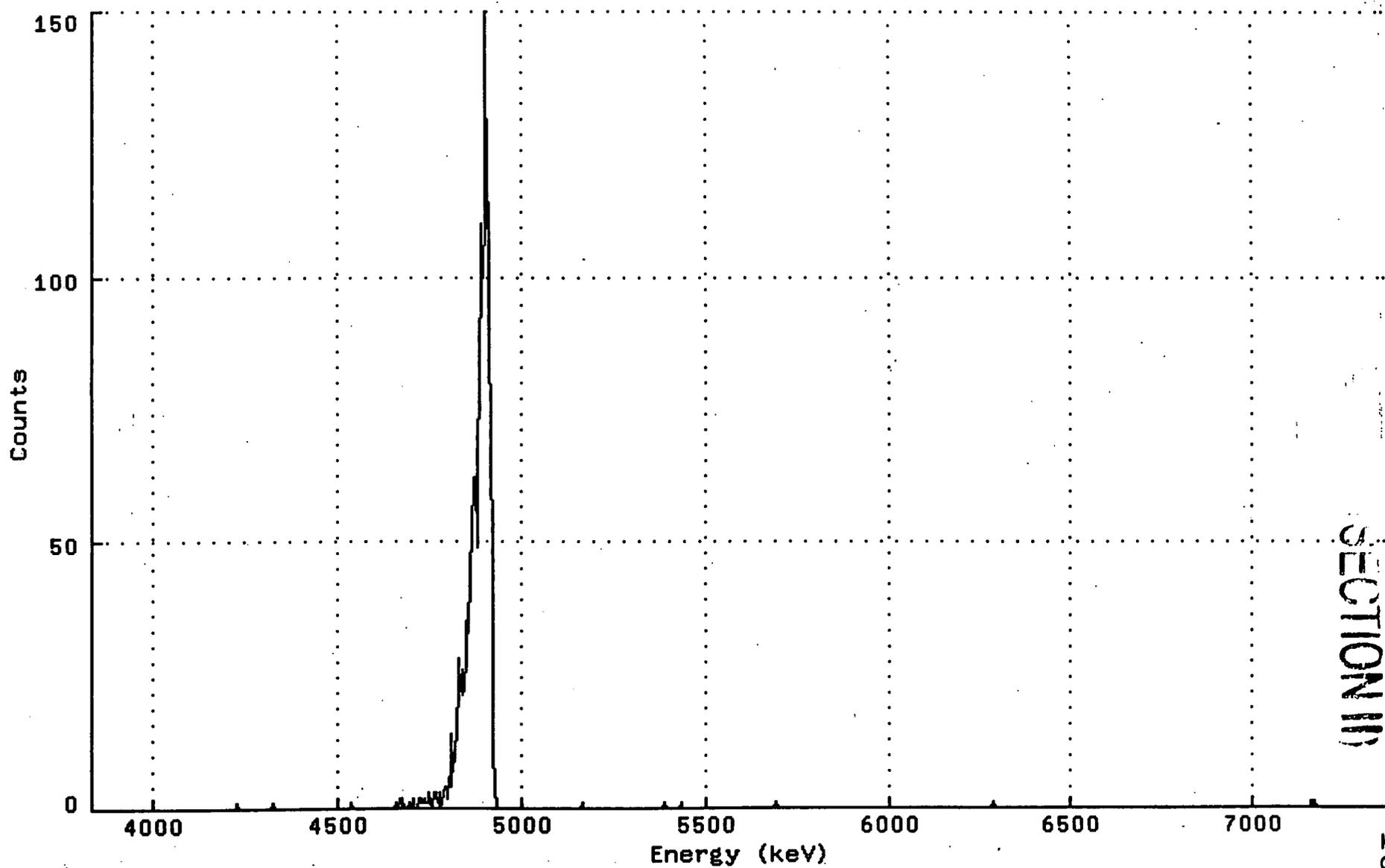
Title : 048

Sample Title:

Start Time: 8-DEC-1999 09:55: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.82185E+03

Real Time : 0 22:13:23.00 Sample ID : 263944 Energy Slope : 3.45055E+00

Live Time : 0 22:13:23.00 Sample Type: PU Energy Quad : 0.00000E+00



336

SECTION 11

153

Spectral File: ND_AMS_ARCHIVE_S:S_99126526\$263931D_PU.CNF

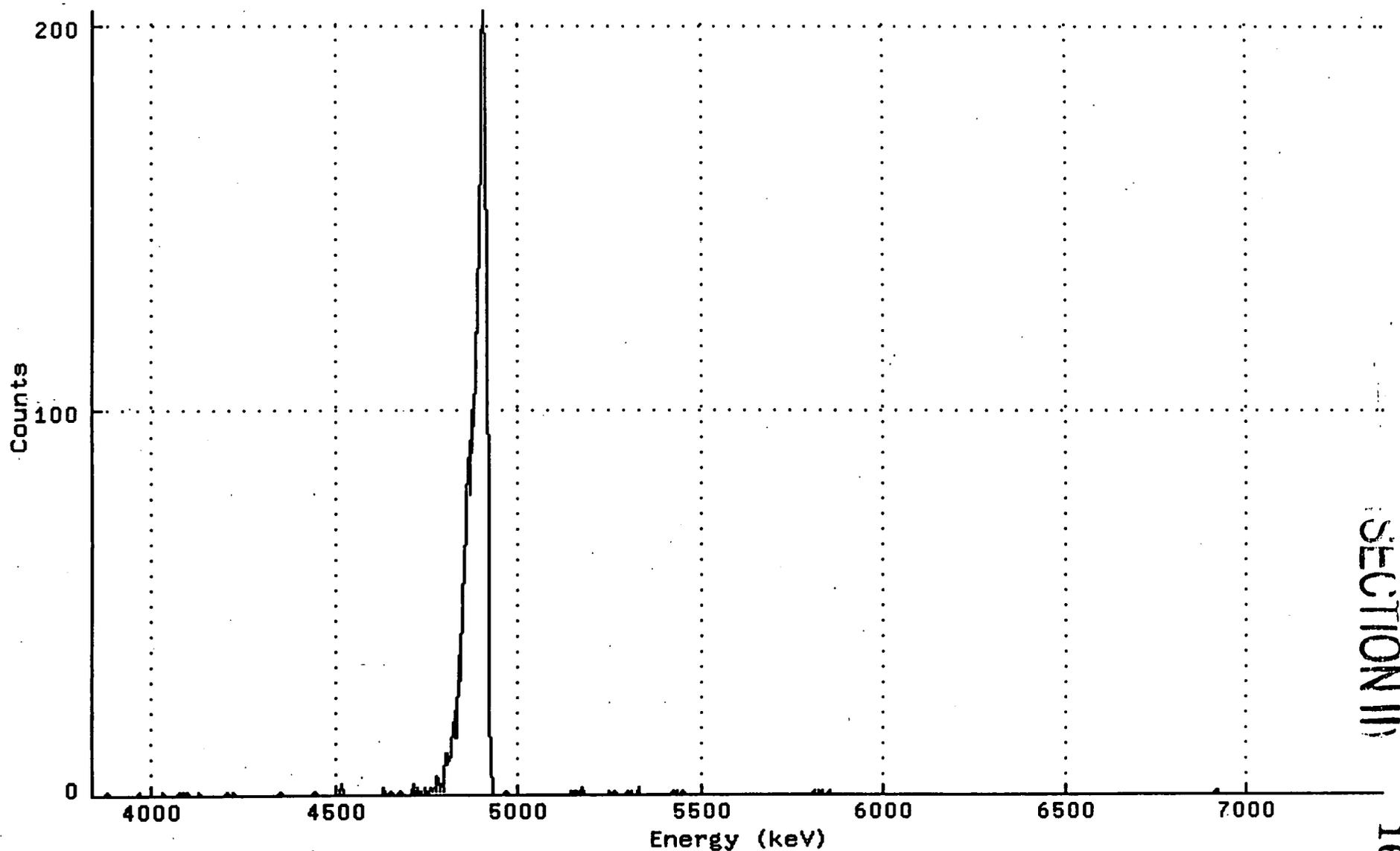
BATCH ID:	99126526	*	SAMPLE ID:	263931D
SAMPLE DATE:	29-NOV-1999 00:00	*	ALIQUOT:	6.310E-02 SA
SAMPLE TITLE:		*	DETECTOR NUMBER:	033
ACQ DATE:	9-DEC-1999 09:47	*	AVERAGE EFFICIENCY:	26.7%
ELAPSED LIVE TIME:	80007.	*	RECOVERY:	83.90%
TRACER ID:	PU242_82-76-1	*	TRACER FWHM (kev):	34.55
LAMBDA VALUE:	100.	*	ROI TYPE:	STANDARD
CORRECTED TRACER DPM:	9.235	*	CONFIDENCE LEVEL:	4.65
SAMPLE MATRIX:	MISC	*	LLD CONSTANT:	2.71
ENERGY CAL DATE:	3-DEC-1999 06:50	*	EFF CAL DATE:	3-DEC-1999 06:50
BKG FILENAME:	B_033_3DEC99	*		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/SA	TPU/ERROR 2-SIGMA	MDC dpm/SA	CRIT LEVEL dpm/SA
U-238	5487.1	2.20	0.80	99.9	1.169E-01	1.938E-01	3.650E-01	2.545E-01
U-239	5147.7	4.40	1.60	99.9	2.338E-01	2.741E-01	4.565E-01	3.002E-01
PU242	4890.7	2768.40	1.60	100.4	1.464E+02	6.681E+00	4.542E-01	2.987E-01

*** RECOUNT SAMPLE CL > 0.067 ***

Spectrum : WIZARD\$DKC200: [AHIGH.ALUSR.ARCHIVE.S]S_99126526\$263931D_PU.CNF; 3
Title : 033
Sample Title:
Start Time: 9-DEC-1999 09:47: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.82871E+03
Real Time : 0 22:13:27.00 Sample ID : 263931D Energy Slope : 3.45977E+00
Live Time : 0 22:13:27.00 Sample Type: PU Energy Quad : 0.00000E+00



332

SECTION III
160

Spectral File: ND_AMS_ARCHIVE_C:C_99126526\$LCSWR33_PU.CNF

```

*
BATCH ID:          99126526      *      SAMPLE ID:          LCSWR33
SAMPLE DATE:       1-JAN-1987 00:00 *      ALIQUOT:           2.500E-01 mL
SAMPLE TITLE:      *      DETECTOR NUMBER:      034
ACQ DATE:          9-DEC-1999 09:47 *      AVERAGE EFFICIENCY: 22.1%
ELAPSED LIVE TIME: 80006.        *      RECOVERY:           72.03%
TRACER ID:         PU242_82-76-1 *      TRACER FWHM (kev):  27.93
LAMBDA VALUE:      100.          *      ROI TYPE:           MANUAL
CORRECTED TRACER DPM: 9.235      *      CONFIDENCE LEVEL:   4.65
SAMPLE MATRIX:     MISC          *      LLD CONSTANT:       2.71
ENERGY CAL DATE:   3-DEC-1999 06:51 *      EFF CAL DATE:       3-DEC-1999 06:51
BKG FILENAME:      B_034_3DEC99  *
*

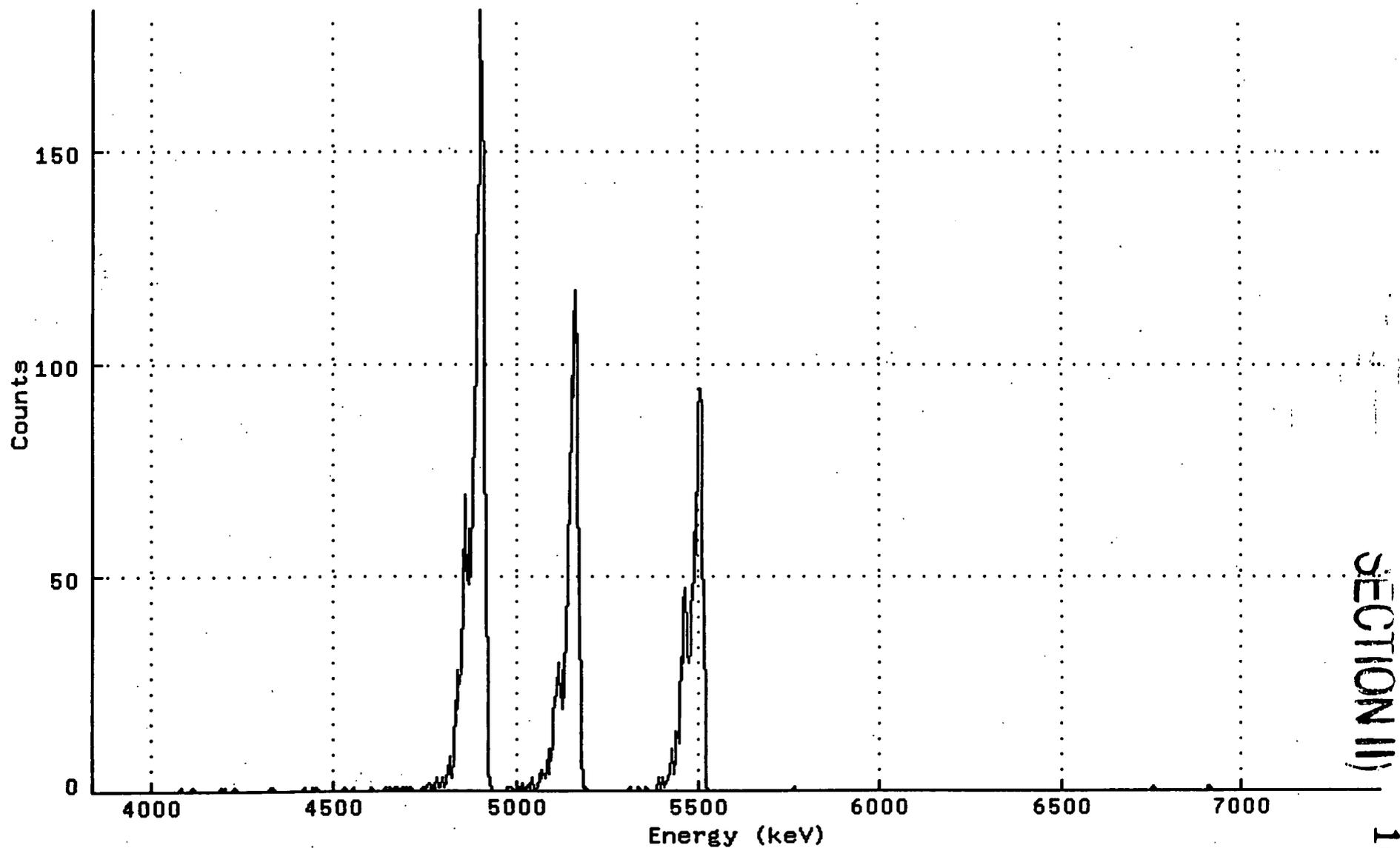
```

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY pCi/ mL	TPU/ERROR 2-SIGMA	MDC pCi/ mL	CRIT LEVEL pCi/ mL
PU-238	5487.1	1120.20	0.80	99.9	1.053E+01	8.771E-01	5.831E-02	4.065E-02
PU-239	5147.7	1212.60	2.40	99.9	1.030E+01	8.409E-01	8.415E-02	5.358E-02
PU242	4890.7	1970.20	2.80	100.4	1.664E+01	8.643E-01	8.860E-02	5.575E-02

*** POSITIVE ***

Spectrum : WIZARD\$DKC200: [AHIGH.ALUSR.ARCHIVE.C]C_99126526\$LCSWR33_PU.CNF; 3
Title : 034
Sample Title:
Start Time: 9-DEC-1999 09:47: Sample Time: 1-JAN-1987 00:00: Energy Offset: 3.82875E+03
Real Time : 0 22:13:26.00 Sample ID : LCSWR33 Energy Slope : 3.46609E+00
Live Time : 0 22:13:26.00 Sample Type: PU Energy Quad : 0.00000E+00



334

SECTION II)

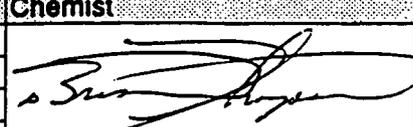
162

Sample Preparation and Analysis Log

SECTION II

163

Sample Type: Various Solids

Method	Isotopes	Worklist Names	Chemist	Date	
Digestion & Purification	RC-19 R06	Am-241	99126647		12/15/99
		Pu-239/240, Pu-238	99126648		
Counting	RC-19 R06	<i>Pu¹⁵⁰</i>	99126648		12/20/99

Tracers (Internal Standards)

Isotope	ID	Conc (pCi/mL) @ RD	Aliquot (mL)	HL (years)	Activity (dpm)	Activity (pCi)
Pu-242	82-76-1	41.60	12/18/89	0.100	3.758E+05	9.24
Am-243	82-76-2	50.80	12/15/92	0.100	7380	11.27

Req	Sample ID	#	Aliquot Size	Comments/ Analysis	Sample Aliquot	Detector Number	Tare Weight(g)	Sample & Container(g)	Total Sample Size (g)
	PB	1	1 SA	Pu, Am		41			
16848	263922	2	0.500 G	Am	0.0460	—	14.561	25.425	10.864
16848	263923	3	0.500 G	Am	0.0420	—	14.565	26.476	11.911
16848	263924	4	0.500 G	Am	0.0320	—	14.692	30.302	15.610
16848	263922D	5	0.500 G	Am Am SB	0.0460	42	14.561	25.425	10.864
	LCSWR33	6	0.250 mL	Pu, Am		43			
	263930	7	0.500 G	Pu		44			
	<i>263930</i>	8							
		9							
		10							
		11							
		12							
		13							
		14							
		15							
		16							
		17							
		18							
		19							
		20							
		21							
		22							
		23							
		24							
		25							
		26							
		27							
		28							
		29							
		30							

Comments and Actual conditions:

Start date: 12/14/99

-Automatic pipets calibrated in accord with QC-6 on balance # 18

Balance # 8 used for weights of samples and their aliquots

Sample aliquot is the fraction of the total sample taken for analysis

Qidny
S. Spant
12/20/99
OK 12/20/99

Spectral File: ND_AMS_ARCHIVE_R:R_99126648\$PB_PU.CNF

```

*
BATCH ID:          99126648      *   SAMPLE ID:          PB
SAMPLE DATE:      29-NOV-1999 00:00 *   ALIQUOT:            1.000E+00   SA
SAMPLE TITLE:          *   DETECTOR NUMBER:      041
ACQ DATE:         16-DEC-1999 15:04 *   AVERAGE EFFICIENCY:  23.1%
ELAPSED LIVE TIME: 80004.        *   RECOVERY:            79.36%
TRACER ID:        PU242_82-76-1  *   TRACER FWHM (kev):   29.08
LAMBDA VALUE:     100.           *   ROI TYPE:           STANDARD
CORRECTED TRACER DPM: 9.235      *   CONFIDENCE LEVEL:   4.65
SAMPLE MATRIX:    MISC          *   LLD CONSTANT:       2.71
ENERGY CAL DATE:  3-DEC-1999 07:05 *   EFF CAL DATE:       3-DEC-1999 07:05
BKG FILENAME:     B_041_3DEC99  *
*

```

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/SA	TPU/ERROR 2-SIGMA	MDC dpm/SA	CRIT LEVEL dpm/SA
PU-238	5487.1	0.60	0.40	99.9	2.461E-03	8.836E-03	2.317E-02	1.714E-02
PU-239	5147.7	1.00	2.00	99.9	4.099E-03	1.599E-02	3.807E-02	2.459E-02
PU242	4890.7	2263.80	1.20	100.4	9.235E+00	4.550E-01	3.184E-02	2.145E-02

Spectrum : WIZARD\$DKC200: [AHIGH.ALUSR.ARCHIVE.R]R_99126648\$PB_PU.CNF; 1

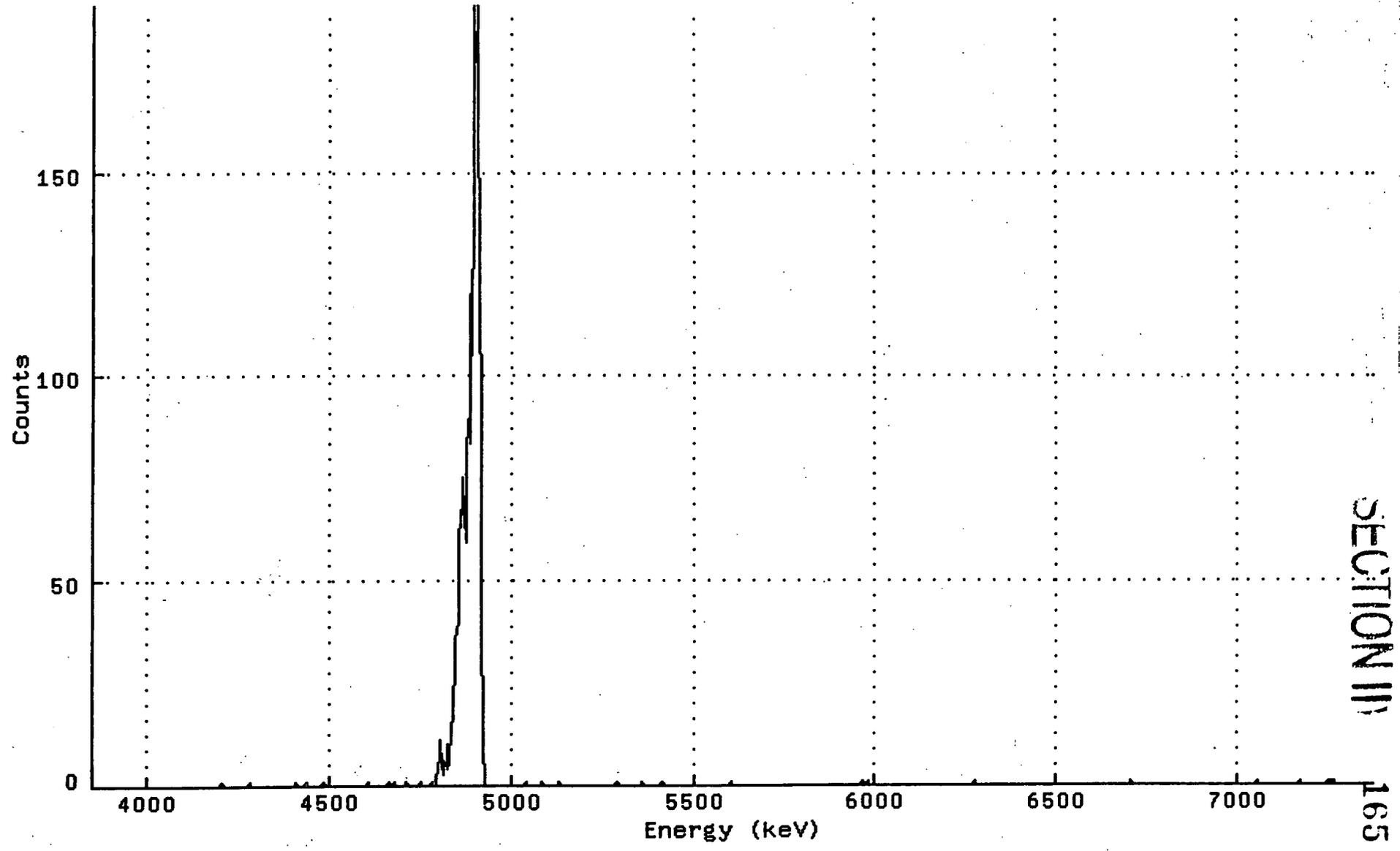
Title : 041

Sample Title:

Start Time: 16-DEC-1999 15:04 Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.83753E+03

Real Time : 0 22:13:24.00 Sample ID : PB Energy Slope : 3.45395E+00

Live Time : 0 22:13:24.00 Sample Type: PU Energy Quad : 0.00000E+00



Spectral File: ND_AMS_ARCHIVE_S:S_99126648\$263830_PU.CNF

BATCH ID:	99126648	*	SAMPLE ID:	263830
SAMPLE DATE:	29-NOV-1999 00:00	*	ALIQOT:	5.000E-01 g
SAMPLE TITLE:		*	DETECTOR NUMBER:	044
ACQ DATE:	16-DEC-1999 15:04	*	AVERAGE EFFICIENCY:	22.8%
ELAPSED LIVE TIME:	80005.	*	RECOVERY:	77.60%
TRACER ID:	PU242_82-76-1	*	TRACER FWHM (kev):	29.92
LAMBDA VALUE:	100.	*	ROI TYPE:	STANDARD
CORRECTED TRACER DPM:	9.235	*	CONFIDENCE LEVEL:	4.65
SAMPLE MATRIX:	MISC	*	LLD CONSTANT:	2.71
ENERGY CAL DATE:	3-DEC-1999 07:11	*	EFF CAL DATE:	3-DEC-1999 07:11
BKG FILENAME:	B_044_3DEC99	*		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY pCi/	TPU/ERROR g 2-SIGMA	MDC pCi/	CRIT LEVEL g pCi/
PU-238	5487.1	5.60	0.40	99.9	2.142E-02	1.903E-02	2.161E-02	1.599E-02
PU-239	5147.7	543.40	1.60	99.9	2.078E+00	2.133E-01	3.286E-02	2.161E-02
PU242	4890.7	2186.60	0.40	100.4	8.320E+00	4.151E-01	2.150E-02	1.591E-02

*** POSITIVE ***

Spectrum : WIZARD\$DKC200: [AHIGH.ALUSR.ARCHIVE.S]S_99126648\$263830_PU.CNF; 1

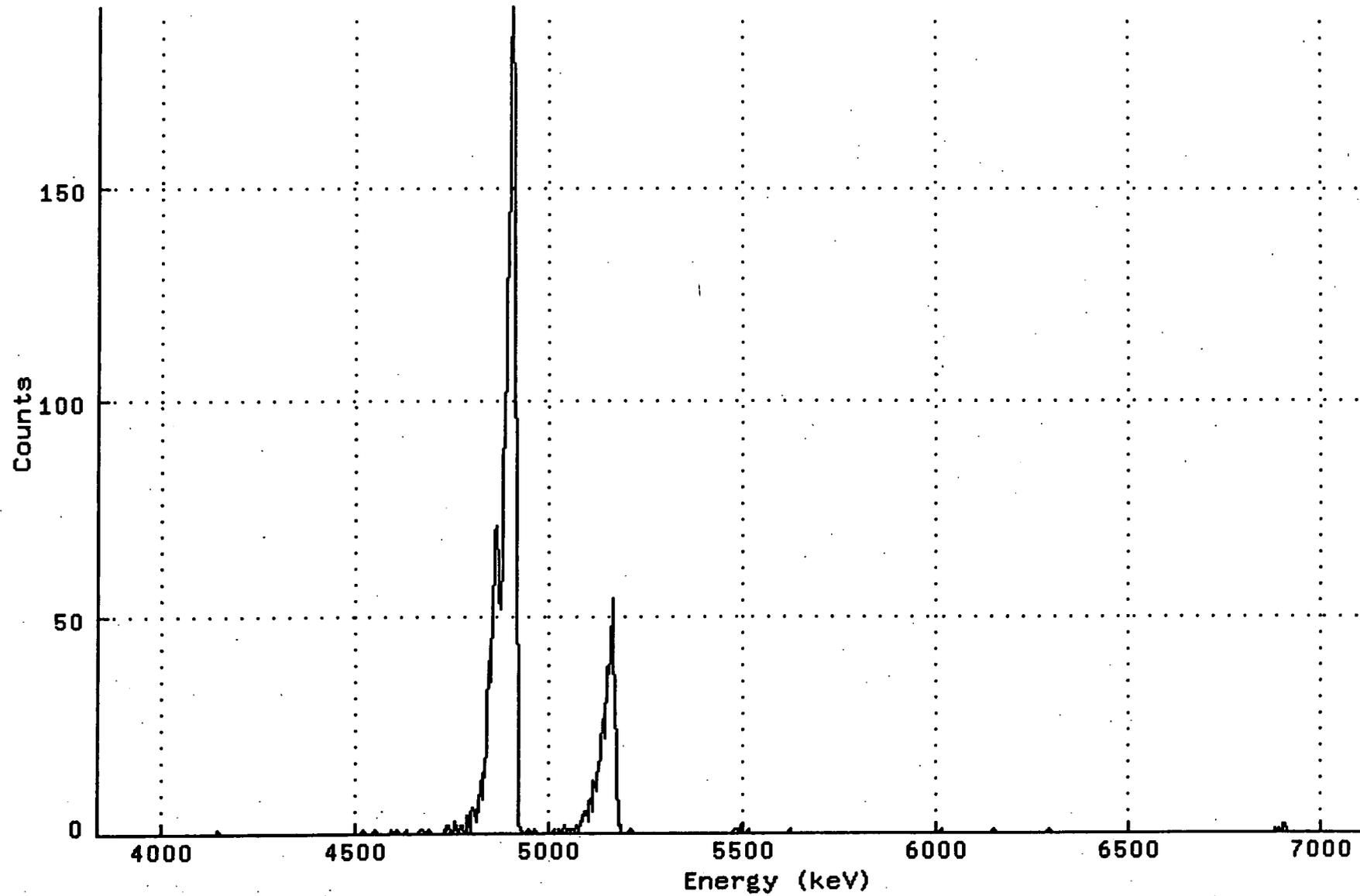
Title : 044

Sample Title:

Start Time: 16-DEC-1999 15:04 Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.82640E+03

Real Time : 0 22:13:25.00 Sample ID : 263830 Energy Slope : 3.44100E+00

Live Time : 0 22:13:25.00 Sample Type: PU Energy Quad : 0.00000E+00



SECTION II

167

339

Spectral File: ND_AMS_ARCHIVE_C:C_99126648\$LCSWR33_PU.CNF

*
BATCH ID: 99126648 * SAMPLE ID: LCSWR33
SAMPLE DATE: 1-JAN-1987 00:00 * ALIQUOT: 2.500E-01 mL
SAMPLE TITLE: * DETECTOR NUMBER: 043
ACQ DATE: 16-DEC-1999 15:04 * AVERAGE EFFICIENCY: 23.1%
ELAPSED LIVE TIME: 80005. * RECOVERY: 74.67%
TRACER ID: PU242_82-76-1 * TRACER FWHM (kev): 29.72
LAMBDA VALUE: 100. * ROI TYPE: STANDARD
CORRECTED TRACER DPM: 9.235 * CONFIDENCE LEVEL: 4.65
SAMPLE MATRIX: MISC * LLD CONSTANT: 2.71
ENERGY CAL DATE: 3-DEC-1999 07:10 * EFF CAL DATE: 3-DEC-1999 07:10
BKG FILENAME: B_043_3DEC99 *
*

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY pCi/ mL	TPU/ERROR 2-SIGMA	MDC pCi/ mL	CRIT LEVEL pCi/ mL
PU-238	5487.1	1215.00	0.00	99.9	1.055E+01	8.489E-01	2.124E-02	2.124E-02
PU-239	5147.7	1456.60	2.40	99.9	1.142E+01	8.799E-01	7.770E-02	4.947E-02
PU242	4890.7	2133.80	1.20	100.4	1.664E+01	8.370E-01	6.086E-02	4.099E-02

*** POSITIVE ***

Spectrum : WIZARD\$DKC200:[AHIGH.ALUSR.ARCHIVE.C]C_99126648\$LCSWR33_PU.CNF;1

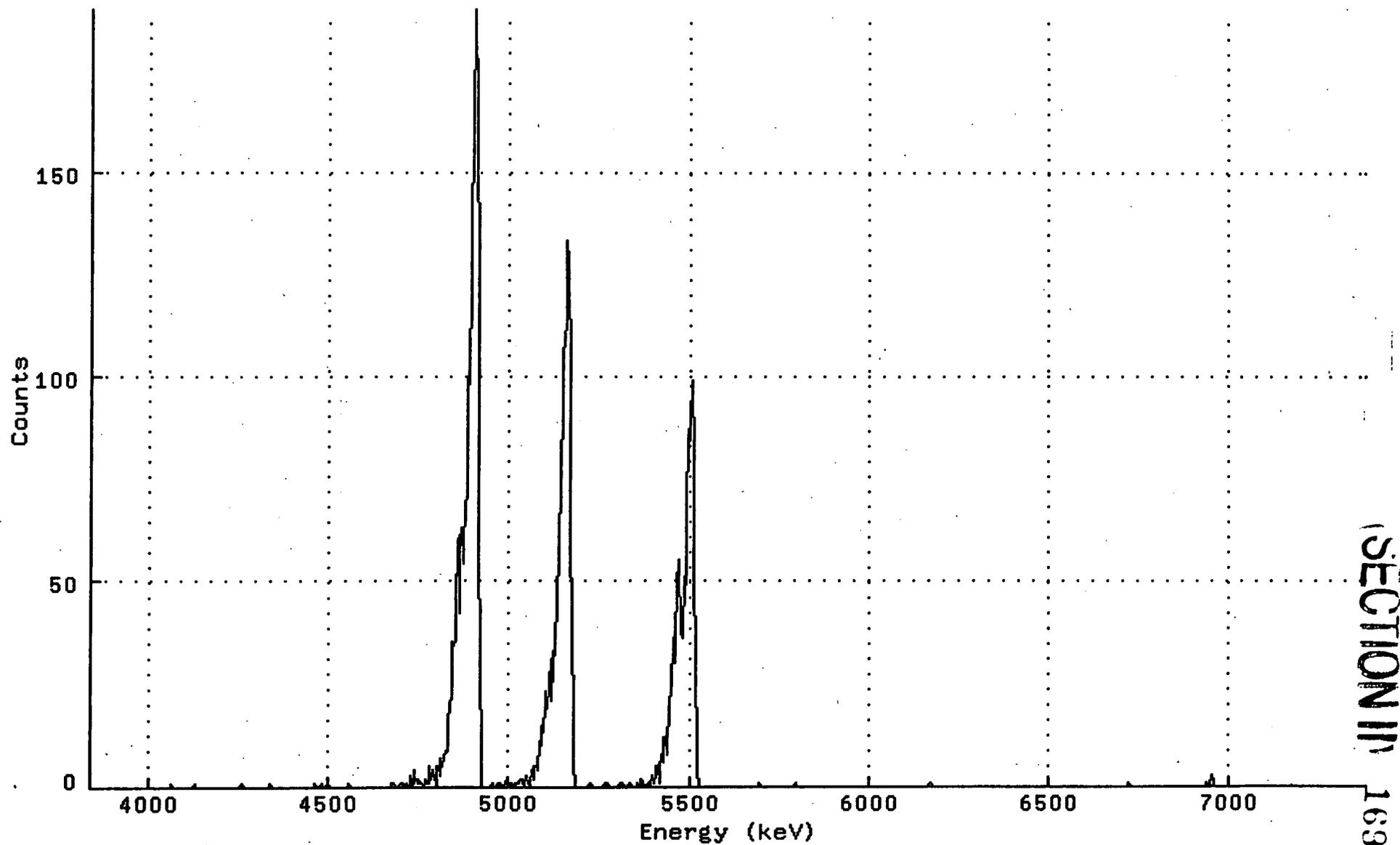
Title : 043

Sample Title:

Start Time: 16-DEC-1999 15:04 Sample Time: 1-JAN-1987 00:00: Energy Offset: 3.83028E+03

Real Time : 0 22:13:25.00 Sample ID : LCSWR33 Energy Slope : 3.46730E+00

Live Time : 0 22:13:25.00 Sample Type: PU Energy Quad : 0.00000E+00



SECTION III 169

341

Sample Preparation and Analysis Log

SECTION II

170

Sample Type: Various Solids

Method	Isotopes	Worklist Names	Chemist	Date	
Digestion & Purification	RC-19 R06	Am-241	99126522	<i>[Signature]</i>	12/7/99
		Pu-239/240, Pu-238	99126523		
		U-238, U235, U234	99126524		
Counting	RC-19 R06	^{U130}	99126524	<i>[Signature]</i>	12/13/99

Tracers (Internal Standards)

Isotope	ID	Conc(pCi/mL) @ RD	Aliquot(mL)	HL (years)	Activity(dpm)	Activity(pCi)
U-232	178-06-3	50.91 12/15/92	0.100	72	10.57	4.76
Am-243	82-76-2	50.80 12/15/92	0.100	7380	11.27	5.08
Pu-242	82-76-1	41.60 12/18/89	0.100	3.758E+05	9.24	4.16

Req	Sample ID	#	Aliquot Size	Comments/ Analysis	Sample Aliquot	Detector Number	Tare Weight(g)	Sample & Container(g)	Total Sample Size (g)
	PB	1	1 SA			4			
16848	263829	2	0.500 G			5			
16848	263830	3	0.500 G			14			
16848	263831	4	0.500 G			15			
16848	263832	5	0.500 G			17			
16848	263921	6	0.500 G		0.0393	18	14.704	27.413	12.709
16848	263922	7	0.500 G		0.0460	21	14.561	25.425	10.864
16848	263923	8	0.500 G		0.0420	22	14.565	26.476	11.911
16848	263924	9	0.500 G		0.0320	23	14.692	30.302	15.610
16848	263925	10	0.500 G		0.0305	27	14.552	30.939	16.387
16848	263926	11	0.500 G		0.0494	28	14.543	24.660	10.117
16848	263927	12	0.500 G		0.0550	30	14.559	23.646	9.087
16848	263928	13	0.500 G		0.0353	31	14.696	28.843	14.147
16848	263929	14	0.500 G		0.0285	32	14.467	32.032	17.565
16848	263930	15	0.500 G		0.0488	4	14.458	24.708	10.250
16848	263921D	16	0.500 G		0.0393	5	14.704	27.413	12.709
LCSWR1, LCSWR33		17	0.250 mL			14			
		18							
		19							
		20							
		21							
		22							
		23							
		24							
		25							
		26							
		27							
		28							
		29							
		30							

Comments and Actual conditions:

- Start date: 12/1/99
- Automatic pipets calibrated in accord with QC-6 on balance # 18
- Balance # 8 used for weights of samples and their aliquots
- Sample aliquot is the fraction of the total sample taken for analysis

OKOM
 12-11-99
 Qidby
 S. Spate
 12/15/99

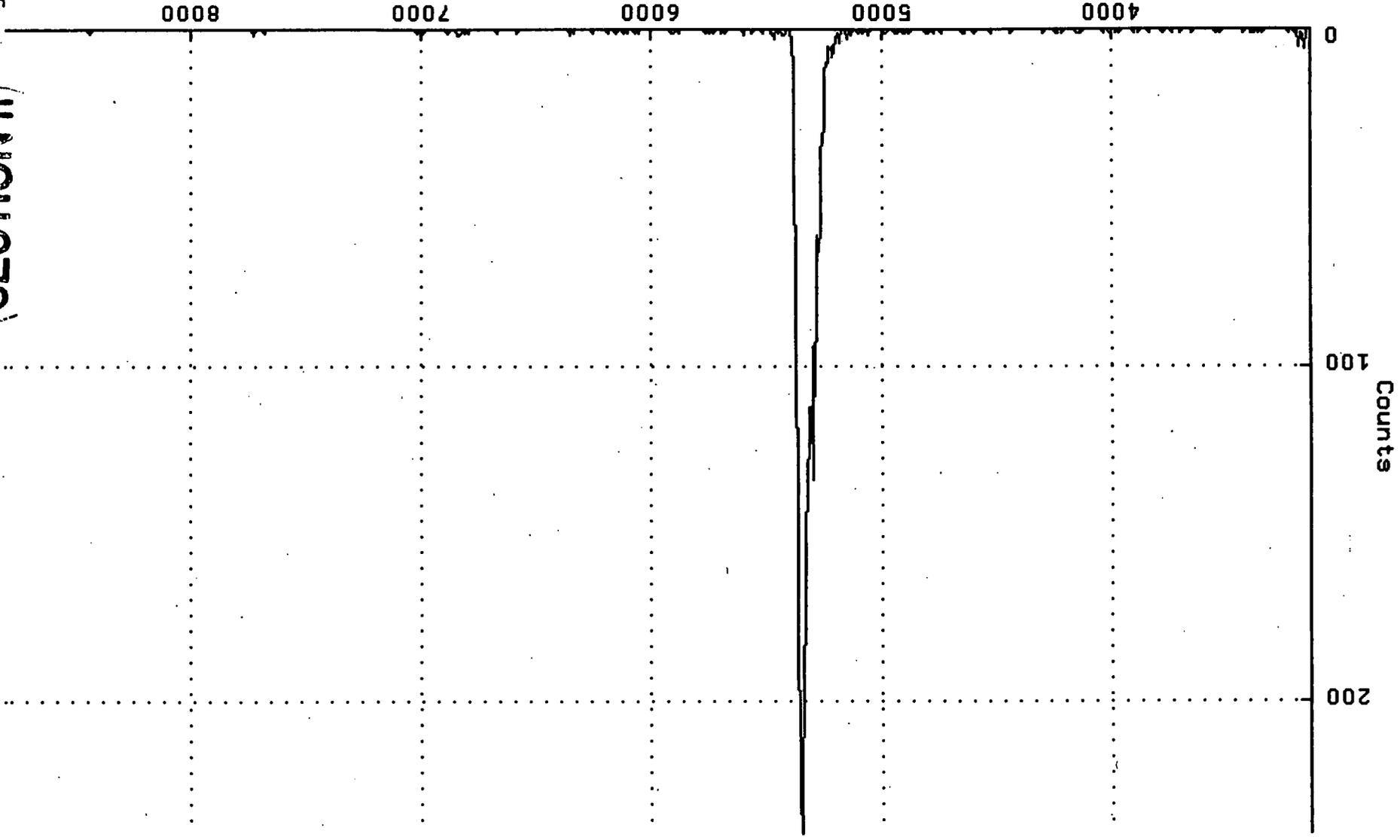
Spectral File: ND_AMS_ARCHIVE_R:R_99126524\$PB_UU.CNF

*
BATCH ID: 99126524 * SAMPLE ID: PB
SAMPLE DATE: 29-NOV-1999 00:00 * ALIQUOT: 1.000E+00 SA
SAMPLE TITLE: * DETECTOR NUMBER: 004
ACQ DATE: 7-DEC-1999 10:01 * AVERAGE EFFICIENCY: 25.5%
ELAPSED LIVE TIME: 80005. * RECOVERY: 80.94%
TRACER ID: U232-178-06-3 * TRACER FWHM (kev): 71.21
LAMBDA VALUE: 100. * ROI TYPE: MANUAL
CORRECTED TRACER DPM: 10.570 * CONFIDENCE LEVEL: 4.65
SAMPLE MATRIX: MISC * LLD CONSTANT: 2.71
ENERGY CAL DATE: 3-DEC-1999 06:15 * EFF CAL DATE: 3-DEC-1999 06:15
BKG FILENAME: B_004_3DEC99 *

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/SA	TPU/ERROR 2-SIGMA	MDC dpm/SA	CRIT LEVEL dpm/SA
U232	5302.5	2908.00	6.00	99.8	1.057E+01	4.750E-01	5.124E-02	3.054E-02
U234	4761.5	4.00	2.00	99.8	1.454E-02	1.897E-02	3.375E-02	2.180E-02
U-235	4385.5	-2.20	5.20	80.9	-9.864E-03	2.021E-02	5.969E-02	3.592E-02
U238	4184.4	4.00	4.00	100.2	1.447E-02	2.243E-02	4.346E-02	2.663E-02

Spectrum : WIZARD\$DKC200: [ALPHA,ALUSR,ARCHIVE,R]R-99126524\$PB-UU,CNF: 2
 Title : 004
 Sample Title:
 Start time: 7-DEC-1999 10:01: Sample time: 29-NOV-1999 00:00 Energy Offset: 3.12078E+03
 Real time : 0 22:13:25.00 Sample ID : PB Energy Slope : 5.54295E+00
 Live time : 0 22:13:25.00 Sample Type: UU Energy Quad : 0.00000E+00



(SECTION II) 172

Spectral File: ND_AMS_ARCHIVE_S:S_99126524\$263829_UU.CNF

```

*
BATCH ID:          99126524      *      SAMPLE ID:          263829
SAMPLE DATE:      29-NOV-1999 00:00 *      ALIQUOT:          5.000E-01 g
SAMPLE TITLE:                    *      DETECTOR NUMBER:      005
ACQ DATE:         7-DEC-1999 10:01 *      AVERAGE EFFICIENCY: 24.8%
ELAPSED LIVE TIME: 80008.        *      RECOVERY:           61.27%
TRACER ID:        U232-178-06-3  *      TRACER FWHM (kev):   52.25
LAMBDA VALUE:     100.           *      ROI TYPE:           MANUAL
CORRECTED TRACER DPM: 10.570     *      CONFIDENCE LEVEL:   4.65
SAMPLE MATRIX:    MISC           *      LLD CONSTANT:       2.71
ENERGY CAL DATE:  3-DEC-1999 06:17 *      EFF CAL DATE:       3-DEC-1999 06:17
BKG FILENAME:     B_005_3DEC99   *
*

```

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY pCi/	TPU/ERROR g 2-SIGMA	MDC pCi/	CRIT LEVEL g pCi/
U232	5302.5	2135.00	6.00	99.8	9.523E+00	4.784E-01	6.288E-02	3.748E-02
U-234	4761.5	81.00	4.00	99.8	3.612E-01	8.545E-02	5.356E-02	3.282E-02
U-235	4385.5	7.40	3.60	80.9	4.071E-02	3.887E-02	6.344E-02	3.918E-02
U-238	4184.4	107.80	3.20	100.2	4.786E-01	9.787E-02	4.897E-02	3.050E-02

*** POSITIVE ***

Spectrum : WIZARD\$DKC200: [ALPHA.ALUSR.ARCHIVE.S]S_99126524\$263829_UU.CNF; 2

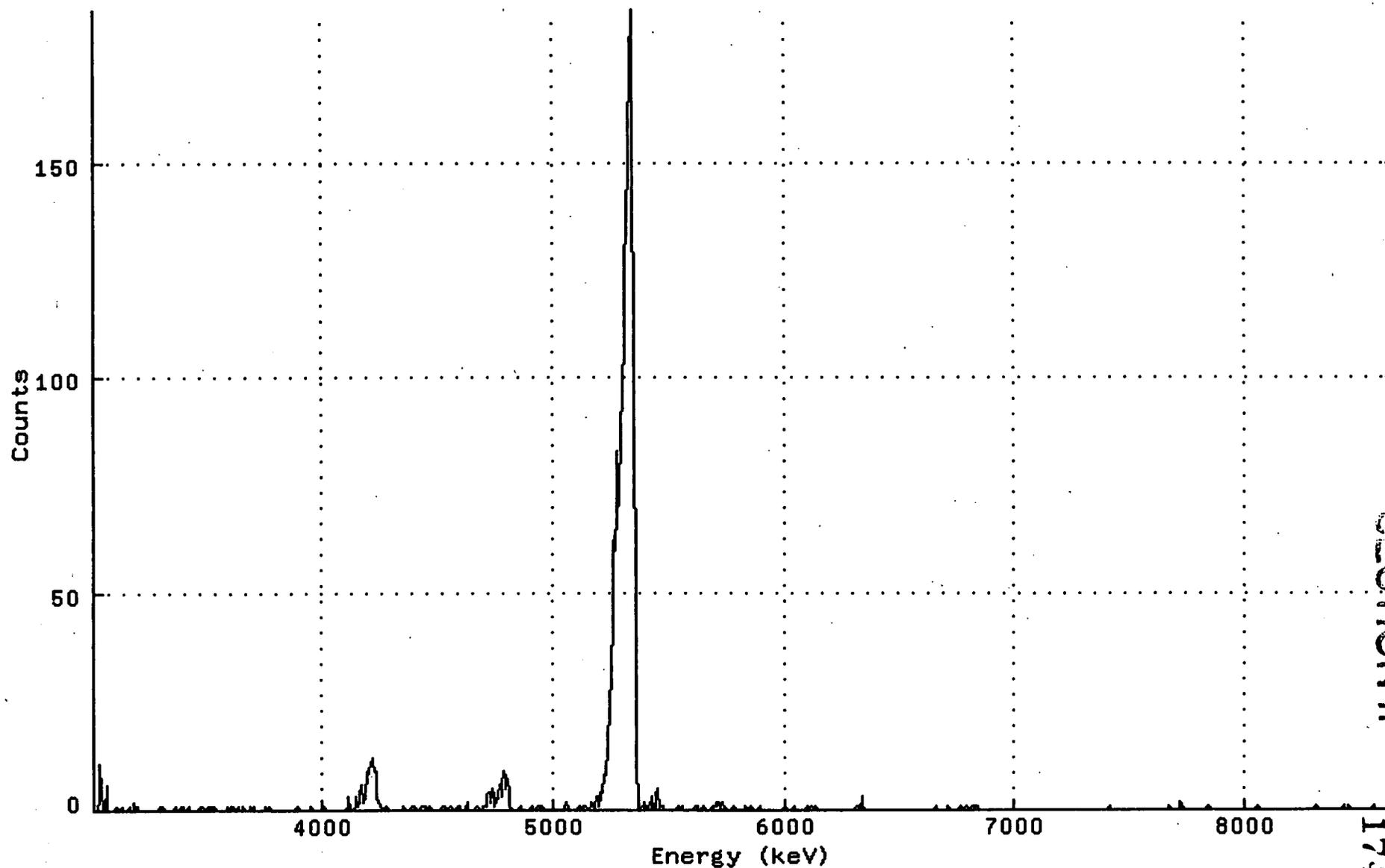
Title : 005

Sample Title:

Start Time: 7-DEC-1999 10:01: Sample Time: 29-NOV-1999 00:00 Energy Offset: 2.99915E+03

Real Time : 0 22:13:28.00 Sample ID : 263829 Energy Slope : 5.48330E+00

Live Time : 0 22:13:28.00 Sample Type: UU Energy Quad : 0.00000E+00



SECTION 11
174

346

 Spectral File: ND_AMS_ARCHIVE_S:S_99126524\$263830_UU.CNF

BATCH ID:	99126524	*	SAMPLE ID:	263830
SAMPLE DATE:	29-NOV-1999 00:00	*	ALIQUOT:	5.000E-01 g
SAMPLE TITLE:		*	DETECTOR NUMBER:	014
ACQ DATE:	7-DEC-1999 10:02	*	AVERAGE EFFICIENCY:	26.1%
ELAPSED LIVE TIME:	80002.	*	RECOVERY:	77.20%
TRACER ID:	U232-178-06-3	*	TRACER FWHM (kev):	69.23
LAMBDA VALUE:	100.	*	ROI TYPE:	MANUAL
CORRECTED TRACER DPM:	10.570	*	CONFIDENCE LEVEL:	4.65
SAMPLE MATRIX:	MISC	*	LLD CONSTANT:	2.71
ENERGY CAL DATE:	3-DEC-1999 06:21	*	EFF CAL DATE:	3-DEC-1999 06:21
BKG FILENAME:	B_014_3DEC99	*		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY pCi/	TPU/ERROR g 2-SIGMA	MDC pCi/	CRIT LEVEL g
U232	5302.5	2837.40	19.60	99.8	9.523E+00	4.322E-01	7.817E-02	4.363E-02
U-234	4761.5	363.00	10.00	99.8	1.218E+00	1.448E-01	5.843E-02	3.376E-02
U-235	4385.5	11.40	7.60	80.9	4.719E-02	3.894E-02	6.428E-02	3.775E-02
U-238	4184.4	348.00	8.00	100.2	1.163E+00	1.403E-01	5.299E-02	3.102E-02

*** POSITIVE ***

Spectrum : WIZARD\$DKC200: [ALPHA.ALUSR.ARCHIVE.S]S_99126524\$263830_UU.CNF; 2

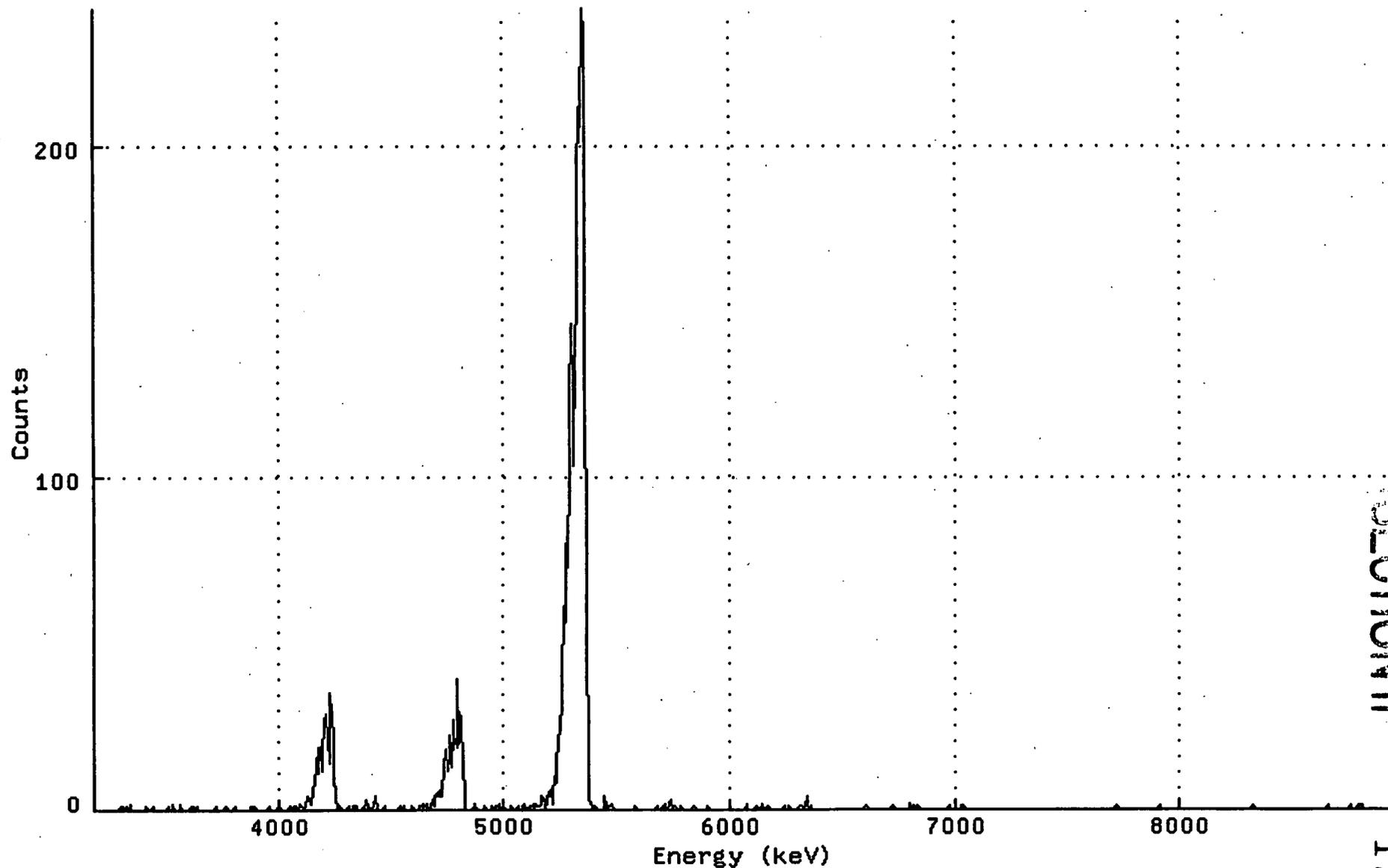
Title : 014

Sample Title:

Start Time: 7-DEC-1999 10:02: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.16850E+03

Real Time : 0 22:13:22.00 Sample ID : 263830 Energy Slope : 5.62876E+00

Live Time : 0 22:13:22.00 Sample Type: UU Energy Quad : 0.00000E+00



348

SECTION II

176

Spectral File: ND_AMS_ARCHIVE_S:S_99126524\$263831_UU.CNF

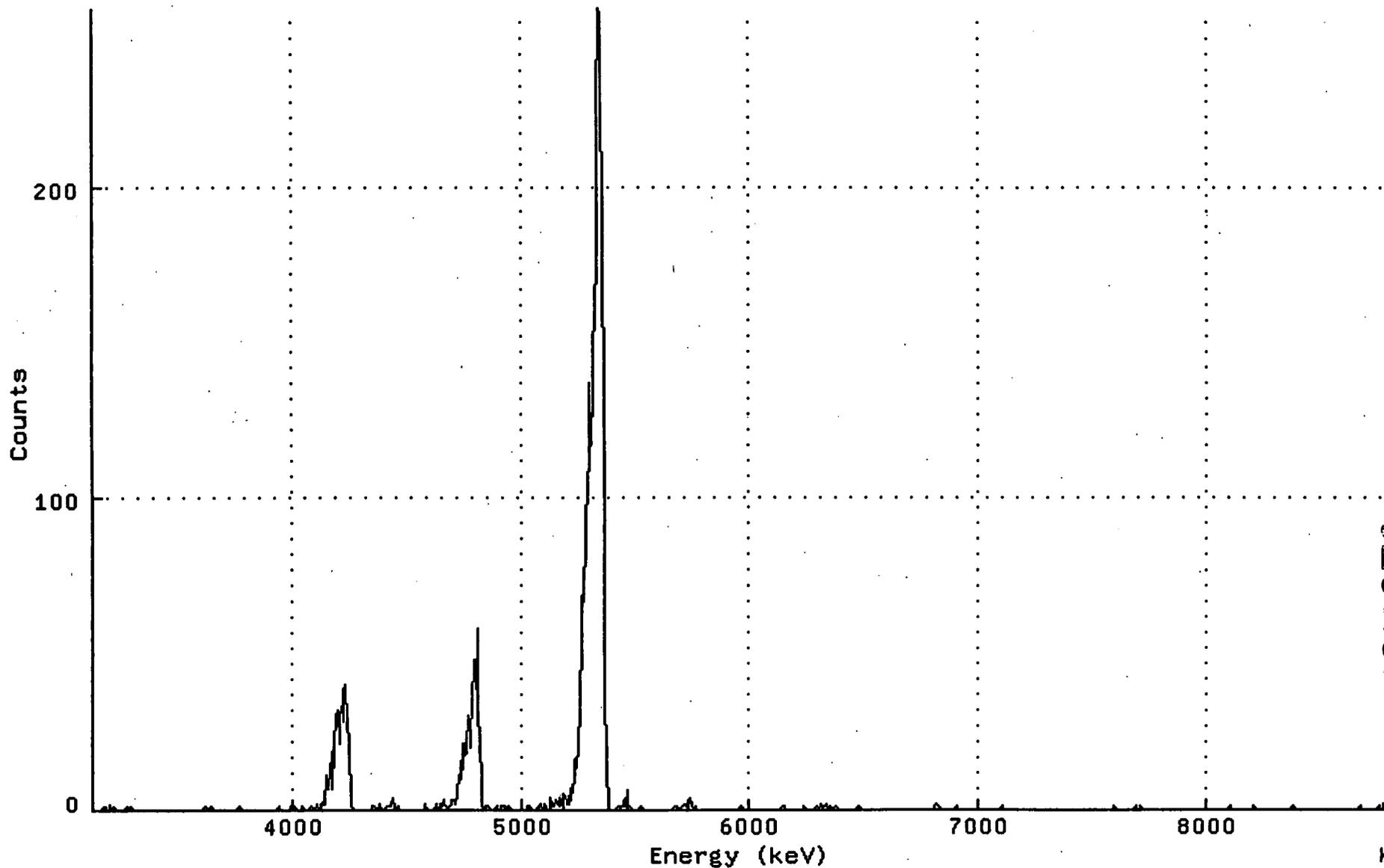
BATCH ID: 99126524 * SAMPLE ID: 263831
SAMPLE DATE: 29-NOV-1999 00:00 * ALIQUOT: 5.000E-01 g
SAMPLE TITLE: * DETECTOR NUMBER: 015
ACQ DATE: 7-DEC-1999 10:02 * AVERAGE EFFICIENCY: 26.1%
ELAPSED LIVE TIME: 80001. * RECOVERY: 79.94%
TRACER ID: U232-178-06-3 * TRACER FWHM (kev): 61.58
LAMBDA VALUE: 100. * ROI TYPE: MANUAL
CORRECTED TRACER DPM: 10.570 * CONFIDENCE LEVEL: 4.65
SAMPLE MATRIX: MISC * LLD CONSTANT: 2.71
ENERGY CAL DATE: 3-DEC-1999 06:23 * EFF CAL DATE: 3-DEC-1999 06:23
BKG FILENAME: B_015_3DEC99 *

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY pCi/ g	TPU/ERROR 2-SIGMA	MDC pCi/ g	CRIT LEVEL pCi/ g
U232	5302.5	2935.40	7.60	99.8	9.523E+00	4.271E-01	5.037E-02	2.958E-02
U-234	4761.5	506.20	2.80	99.8	1.642E+00	1.692E-01	3.403E-02	2.141E-02
U-235	4385.5	17.40	1.60	80.9	6.962E-02	3.564E-02	3.438E-02	2.261E-02
U-238	4184.4	460.80	1.20	100.2	1.488E+00	1.587E-01	2.520E-02	1.698E-02

*** POSITIVE ***

Spectrum : WIZARD\$DKC200: [ALPHA.ALUSR.ARCHIVE.S]S_99126524\$263831_UU.CNF; 2
Title : 015
Sample Title:
Start Time: 7-DEC-1999 10:02: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.11170E+03
Real Time : 0 22:13:21.00 Sample ID : 263831 Energy Slope : 5.53627E+00
Live Time : 0 22:13:21.00 Sample Type: UU Energy Quad : 0.00000E+00



350

SECTION II

173

Spectral File: ND_AMS_ARCHIVE_S:S_99126524\$263832_UU.CNF

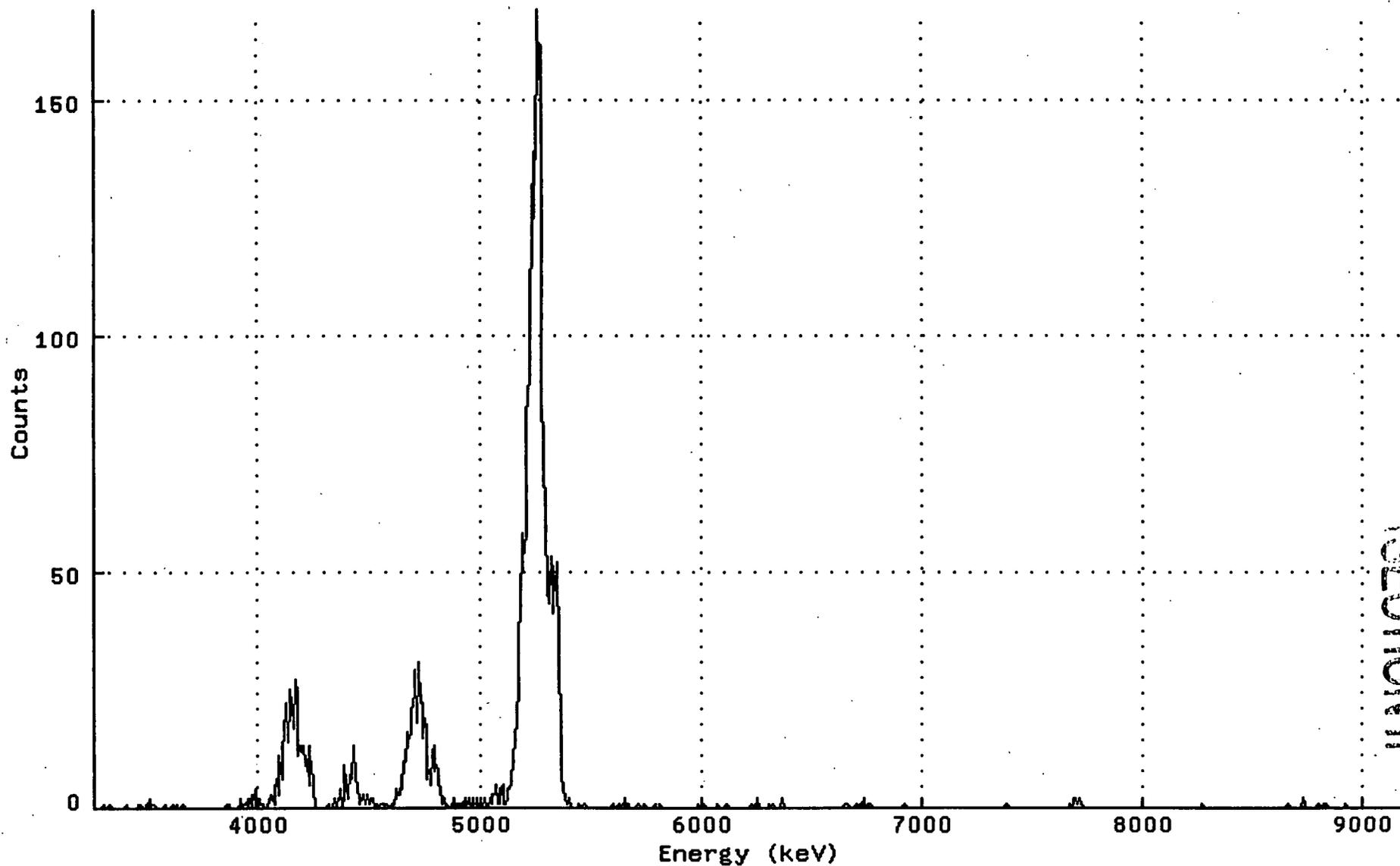
```
BATCH ID:          99126524      *      SAMPLE ID:          263832
SAMPLE DATE:      29-NOV-1999 00:00 *      ALIQUOT:           5.000E-01 g
SAMPLE TITLE:     *      DETECTOR NUMBER:      017
ACQ DATE:         7-DEC-1999 10:03 *      AVERAGE EFFICIENCY: 26.1%
ELAPSED LIVE TIME: 80001.         *      RECOVERY:           74.84%
TRACER ID:        U232-178-06-3   *      TRACER FWHM (kev):  69.22
LAMBDA VALUE:     100.             *      ROI TYPE:          MANUAL
CORRECTED TRACER DPM: 10.570      *      CONFIDENCE LEVEL:  4.65
SAMPLE MATRIX:    MISC             *      LLD CONSTANT:      2.71
ENERGY CAL DATE:  3-DEC-1999 06:24 *      EFF CAL DATE:      3-DEC-1999 06:24
BKG FILENAME:     B_017_3DEC99    *
*****
```

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY pCi/	TPU/ERROR g	MDC pCi/	CRIT LEVEL g
U232	5302.5	2751.40	7.60	99.8	9.523E+00	4.371E-01	5.373E-02	3.156E-02
U-234	4761.5	466.20	4.80	99.8	1.613E+00	1.727E-01	4.463E-02	2.700E-02
U-235	4385.5	104.60	4.40	80.9	4.465E-01	9.285E-02	5.320E-02	3.239E-02
U-238	4184.4	410.00	2.00	100.2	1.413E+00	1.584E-01	3.199E-02	2.067E-02

*** POSITIVE ***

Spectrum : WIZARD\$DKC200: [ALPHA.ALUSR.ARCHIVE.S]S_99126524\$263832_UU.CNF; 2
Title : 017
Sample Title:
Start Time: 7-DEC-1999 10:03: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.24209E+03
Real Time : 0 22:13:22.00 Sample ID : 263832 Energy Slope : 5.79799E+00
Live Time : 0 22:13:21.00 Sample Type: UU Energy Quad : 0.00000E+00



SECTION 11

180

352

 Spectral File: ND_AMS_ARCHIVE_S:S_99126524\$263921_UU.CNF

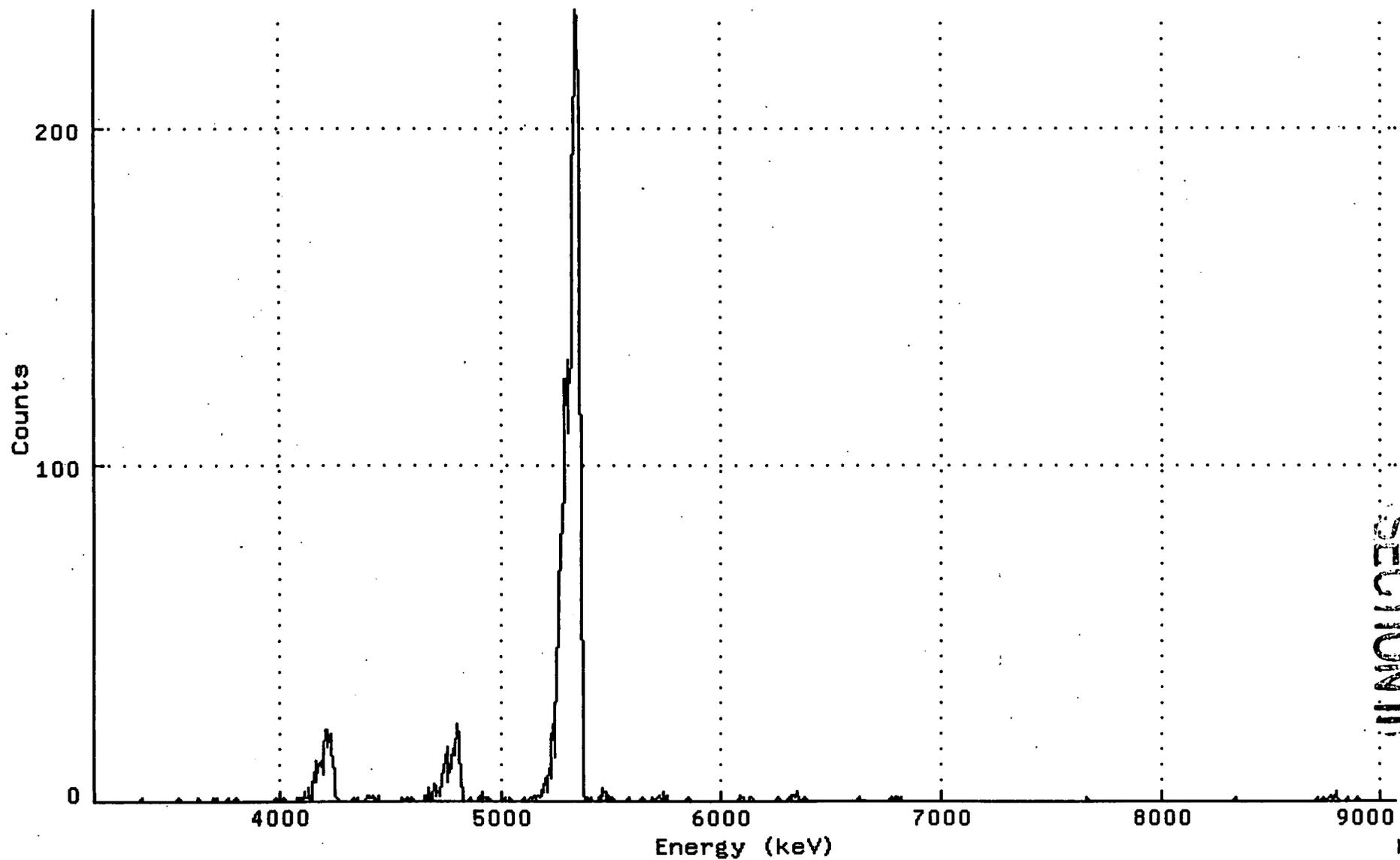
BATCH ID:	99126524	*	SAMPLE ID:	263921
SAMPLE DATE:	29-NOV-1999 00:00	*	ALIQUOT:	3.930E-02 SA
SAMPLE TITLE:		*	DETECTOR NUMBER:	018
ACQ DATE:	7-DEC-1999 10:03	*	AVERAGE EFFICIENCY:	26.1%
ELAPSED LIVE TIME:	80000.	*	RECOVERY:	76.15%
TRACER ID:	U232-178-06-3	*	TRACER FWHM (kev):	73.23
LAMBDA VALUE:	100.	*	ROI TYPE:	MANUAL
CORRECTED TRACER DPM:	10.570	*	CONFIDENCE LEVEL:	4.65
SAMPLE MATRIX:	MISC	*	LLD CONSTANT:	2.71
ENERGY CAL DATE:	3-DEC-1999 06:26	*	EFF CAL DATE:	3-DEC-1999 06:26
BKG FILENAME:	B_018_3DEC99	*		

 NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/	TPU/ERROR SA 2-SIGMA	MDC dpm/	CRIT LEVEL SA dpm/
U232	5302.5	2796.40	3.60	99.8	2.690E+02	1.224E+01	1.109E+00	6.848E-01
U-234	4761.5	232.80	5.20	99.8	2.239E+01	3.199E+00	1.280E+00	7.704E-01
U-235	4385.5	13.80	1.20	80.9	1.637E+00	9.373E-01	9.257E-01	6.236E-01
U-238	4184.4	242.80	1.20	100.2	2.325E+01	3.229E+00	7.472E-01	5.033E-01

 *** POSITIVE ***
 *** RECOUNT SAMPLE CL > 0.500 ***

Spectrum : WIZARD\$DKC200: [ALPHA.ALUSR.ARCHIVE.S]S_99126524\$263921_UU.CNF; 2
Title : 018
Sample Title:
Start Time: 7-DEC-1999 10:03: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.14472E+03
Real Time : 0 22:13:20.00 Sample ID : 263921 Energy Slope : 5.77493E+00
Live Time : 0 22:13:20.00 Sample Type: UU Energy Quad : 0.00000E+00



SECTION II

182

354

 Spectral File: ND_AMS_ARCHIVE_S:S_99126524\$263922_UU.CNF

BATCH ID:	99126524	SAMPLE ID:	263922
SAMPLE DATE:	29-NOV-1999 00:00	ALIQUOT:	4.600E-02 SA
SAMPLE TITLE:		DETECTOR NUMBER:	021
ACQ DATE:	7-DEC-1999 10:04	AVERAGE EFFICIENCY:	26.4%
ELAPSED LIVE TIME:	80003.	RECOVERY:	79.26%
TRACER ID:	U232-178-06-3	TRACER FWHM (kev):	73.24
LAMBDA VALUE:	100.	ROI TYPE:	MANUAL
CORRECTED TRACER DPM:	10.570	CONFIDENCE LEVEL:	4.65
SAMPLE MATRIX:	MISC	LLD CONSTANT:	2.71
ENERGY CAL DATE:	3-DEC-1999 06:27	EFF CAL DATE:	3-DEC-1999 06:27
BKG FILENAME:	B_021_3DEC99		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/SA	TPU/ERROR 2-SIGMA	MDC dpm/SA	CRIT LEVEL dpm/SA
U232	5302.5	2942.00	4.00	99.8	2.298E+02	1.027E+01	9.378E-01	5.747E-01
U-234	4761.5	213.40	3.60	99.8	1.666E+01	2.462E+00	9.006E-01	5.561E-01
U-235	4385.5	9.60	2.40	80.9	9.248E-01	6.952E-01	9.550E-01	6.080E-01
U-238	4184.4	208.20	0.80	100.2	1.619E+01	2.398E+00	5.341E-01	3.724E-01

*** POSITIVE ***
 *** RECOUNT SAMPLE CL > 0.500 ***

Spectrum : WIZARD\$DKC200: [ALPHA.ALUSR.ARCHIVE.S]S_99126524\$263922_UU.CNF; 2

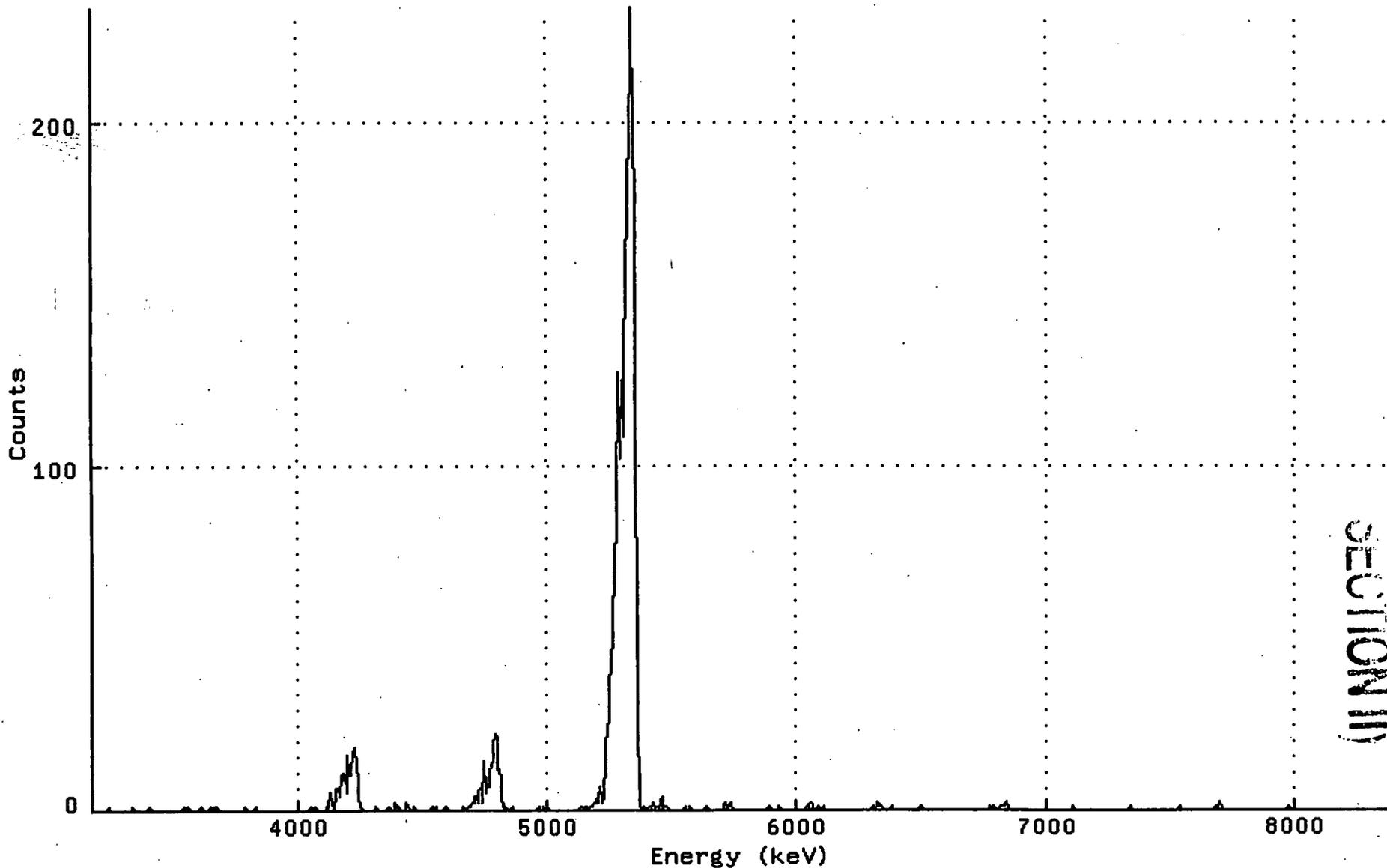
Title : 021

Sample Title:

Start Time: 7-DEC-1999 10:04: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.16443E+03

Real Time : 0 22:13:23.00 Sample ID : 263922 Energy Slope : 5.08660E+00

Live Time : 0 22:13:23.00 Sample Type: UU Energy Quad : 0.00000E+00



356

184

 Spectral File: ND_AMS_ARCHIVE_S:S_99126524\$263923_UU.CNF

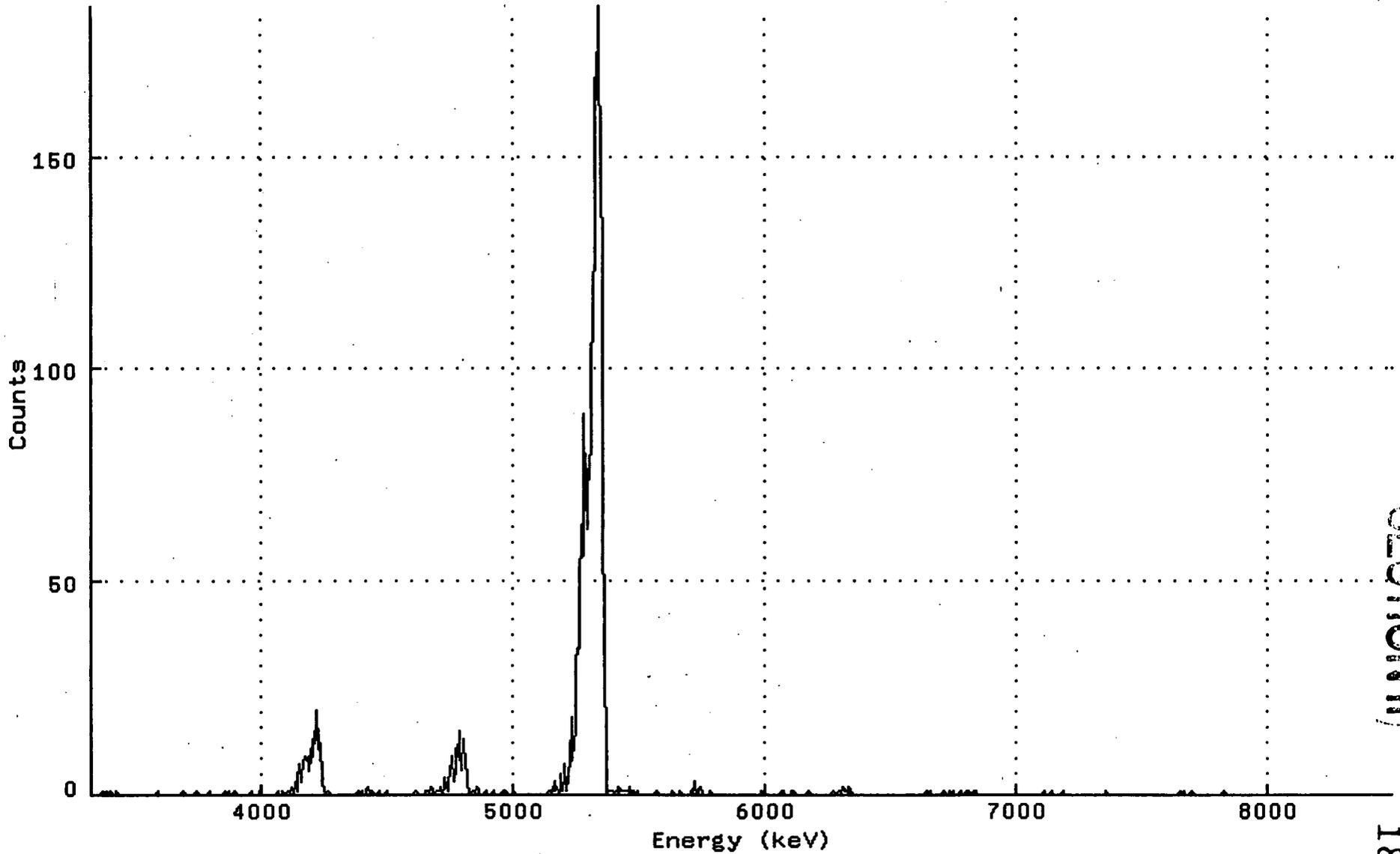
BATCH ID:	99126524	*	SAMPLE ID:	263923
SAMPLE DATE:	29-NOV-1999 00:00	*	ALIQUOT:	4.200E-02 SA
SAMPLE TITLE:		*	DETECTOR NUMBER:	022
ACQ DATE:	7-DEC-1999 10:04	*	AVERAGE EFFICIENCY:	26.1%
ELAPSED LIVE TIME:	80001.	*	RECOVERY:	60.41%
TRACER ID:	U232-178-06-3	*	TRACER FWHM (kev):	45.34
LAMBDA VALUE:	100.	*	ROI TYPE:	MANUAL
CORRECTED TRACER DPM:	10.570	*	CONFIDENCE LEVEL:	4.65
SAMPLE MATRIX:	MISC	*	LLD CONSTANT:	2.71
ENERGY CAL DATE:	3-DEC-1999 06:29	*	EFF CAL DATE:	3-DEC-1999 06:29
BKG FILENAME:	B_022_3DEC99	*		

 NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY		MDC		CRIT LEVEL	
					dpm/	SA	2-SIGMA	dpm/	SA	dpm/
U232	5302.5	2219.80	3.20	99.8	2.517E+02	1.247E+01	1.250E+00	7.786E-01		
U-234	4761.5	140.40	3.60	99.8	1.591E+01	2.874E+00	1.307E+00	8.072E-01		
U-235	4385.5	6.00	2.00	80.9	8.390E-01	8.309E-01	1.298E+00	8.387E-01		
U-238	4184.4	192.60	2.40	100.2	2.174E+01	3.384E+00	1.119E+00	7.124E-01		

 *** POSITIVE ***
 *** RECOUNT SAMPLE CL > 0.500 ***

Spectrum : WIZARD\$DKC200:[ALPHA.ALUSR.ARCHIVE.S]S_99126524\$263923_UU.CNF; 2
Title : 022
Sample Title:
Start Time: 7-DEC-1999 10:04: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.31390E+03
Real Time : 0 22:13:21.00 Sample ID : 263923 Energy Slope : 5.05871E+00
Live Time : 0 22:13:21.00 Sample Type: UU Energy Quad : 0.00000E+00



SECTION II

186

358

Spectral File: ND_AMS_ARCHIVE_S:S_99126524\$263924_UU.CNF

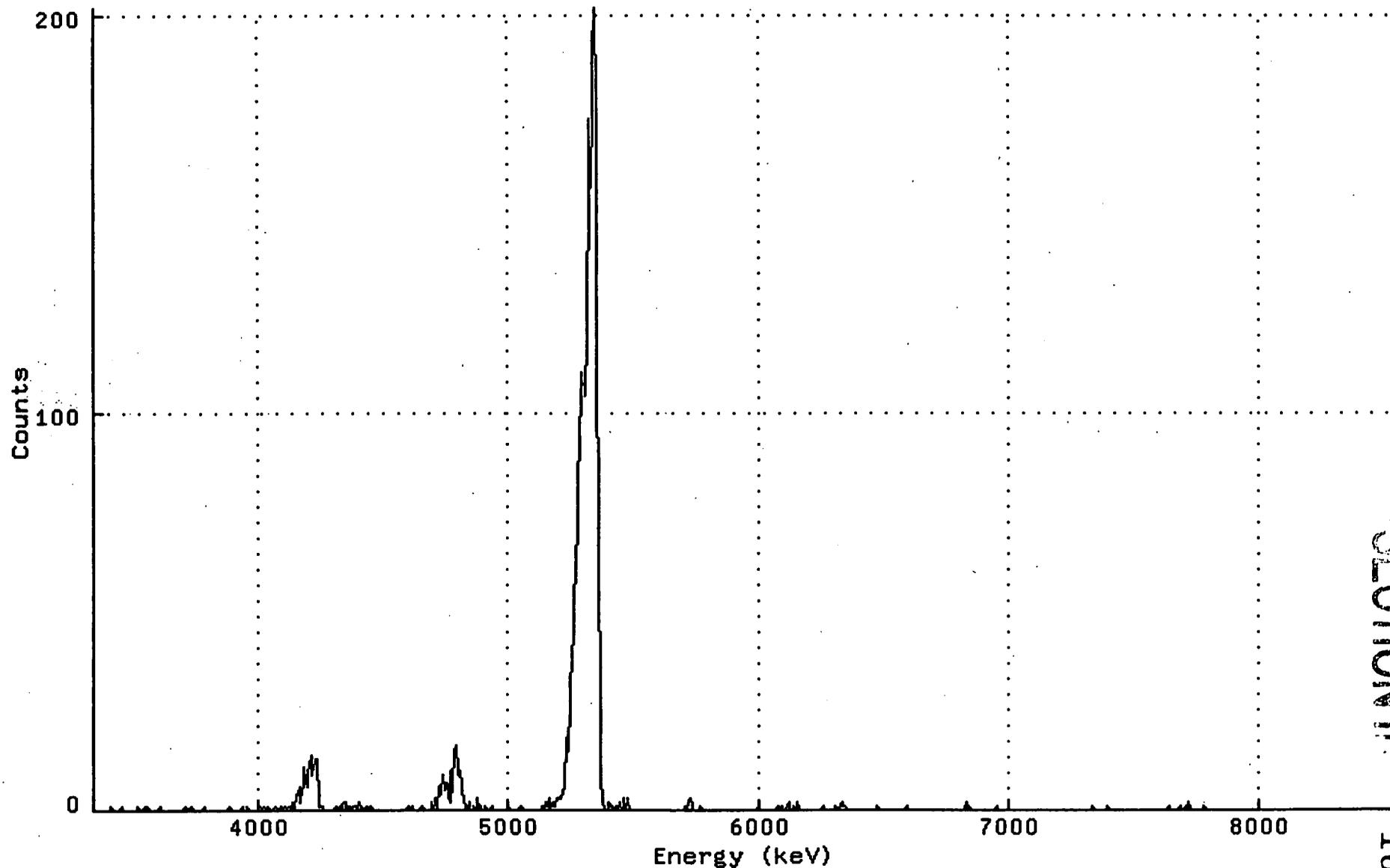
BATCH ID:	99126524	*	SAMPLE ID:	263924
SAMPLE DATE:	29-NOV-1999 00:00	*	ALIQOT:	3.200E-02 SA
SAMPLE TITLE:		*	DETECTOR NUMBER:	023
ACQ DATE:	7-DEC-1999 10:04	*	AVERAGE EFFICIENCY:	25.8%
ELAPSED LIVE TIME:	80000.	*	RECOVERY:	74.18%
TRACER ID:	U232-178-06-3	*	TRACER FWHM (kev):	69.83
LAMBDA VALUE:	100.	*	ROI TYPE:	MANUAL
CORRECTED TRACER DPM:	10.570	*	CONFIDENCE LEVEL:	4.65
SAMPLE MATRIX:	MISC	*	LLD CONSTANT:	2.71
ENERGY CAL DATE:	3-DEC-1999 06:30	*	EFF CAL DATE:	3-DEC-1999 06:30
BKG FILENAME:	B_023_3DEC99	*		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/	TPU/ERROR SA 2-SIGMA	MDC dpm/	CRIT LEVEL SA	SA
U232	5302.5	2688.40	5.60	99.8	3.303E+02	1.525E+01	1.685E+00	1.009E+00	
U-234	4761.5	163.80	3.20	99.8	2.012E+01	3.358E+00	1.355E+00	8.438E-01	
U-235	4385.5	15.00	2.00	80.9	2.273E+00	1.284E+00	1.407E+00	9.089E-01	
U-238	4184.4	159.80	3.20	100.2	1.955E+01	3.300E+00	1.349E+00	8.402E-01	

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.500 ***

Spectrum : WIZARD\$DKC200: [ALPHA.ALUSR.ARCHIVE.S]S_99126524\$263924_UU.CNF; 2
Title : 023
Sample Title:
Start Time: 7-DEC-1999 10:04: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.33394E+03
Real Time : 0 22:13:21.00 Sample ID : 263924 Energy Slope : 5.07911E+00
Live Time : 0 22:13:20.00 Sample Type: UU Energy Quad : 0.00000E+00



SECTION II

183

360

Spectral File: ND_AMS_ARCHIVE_S:S_99126524\$263925_UU.CNF

BATCH ID: 99126524 * SAMPLE ID: 263925
SAMPLE DATE: 29-NOV-1999 00:00 * ALIQUOT: 3.050E-02 SA
SAMPLE TITLE: * DETECTOR NUMBER: 027
ACQ DATE: 7-DEC-1999 10:05 * AVERAGE EFFICIENCY: 26.7%
ELAPSED LIVE TIME: 80003. * RECOVERY: 80.98%
TRACER ID: U232-178-06-3 * TRACER FWHM (kev): 72.06
LAMBDA VALUE: 100. * ROI TYPE: MANUAL
CORRECTED TRACER DPM: 10.570 * CONFIDENCE LEVEL: 4.65
SAMPLE MATRIX: MISC * LLD CONSTANT: 2.71
ENERGY CAL DATE: 3-DEC-1999 06:34 * EFF CAL DATE: 3-DEC-1999 06:34
BKG FILENAME: B_027_3DEC99 *

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/	TPU/ERROR SA 2-SIGMA	MDC dpm/	CRIT LEVEL SA	SA
U232	5302.5	3035.20	6.80	99.8	3.466E+02	1.536E+01	1.694E+00	1.001E+00	
U-234	4761.5	281.40	1.60	99.8	3.212E+01	4.180E+00	9.808E-01	6.451E-01	
U-235	4385.5	10.00	4.00	80.9	1.408E+00	1.115E+00	1.691E+00	1.036E+00	
U-238	4184.4	280.40	1.60	100.2	3.187E+01	4.154E+00	9.766E-01	6.423E-01	

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.500 ***

Spectrum : WIZARD\$DKC200: [ALPHA.ALUSR.ARCHIVE.S]S_99126524\$263925_UU.CNF; 2

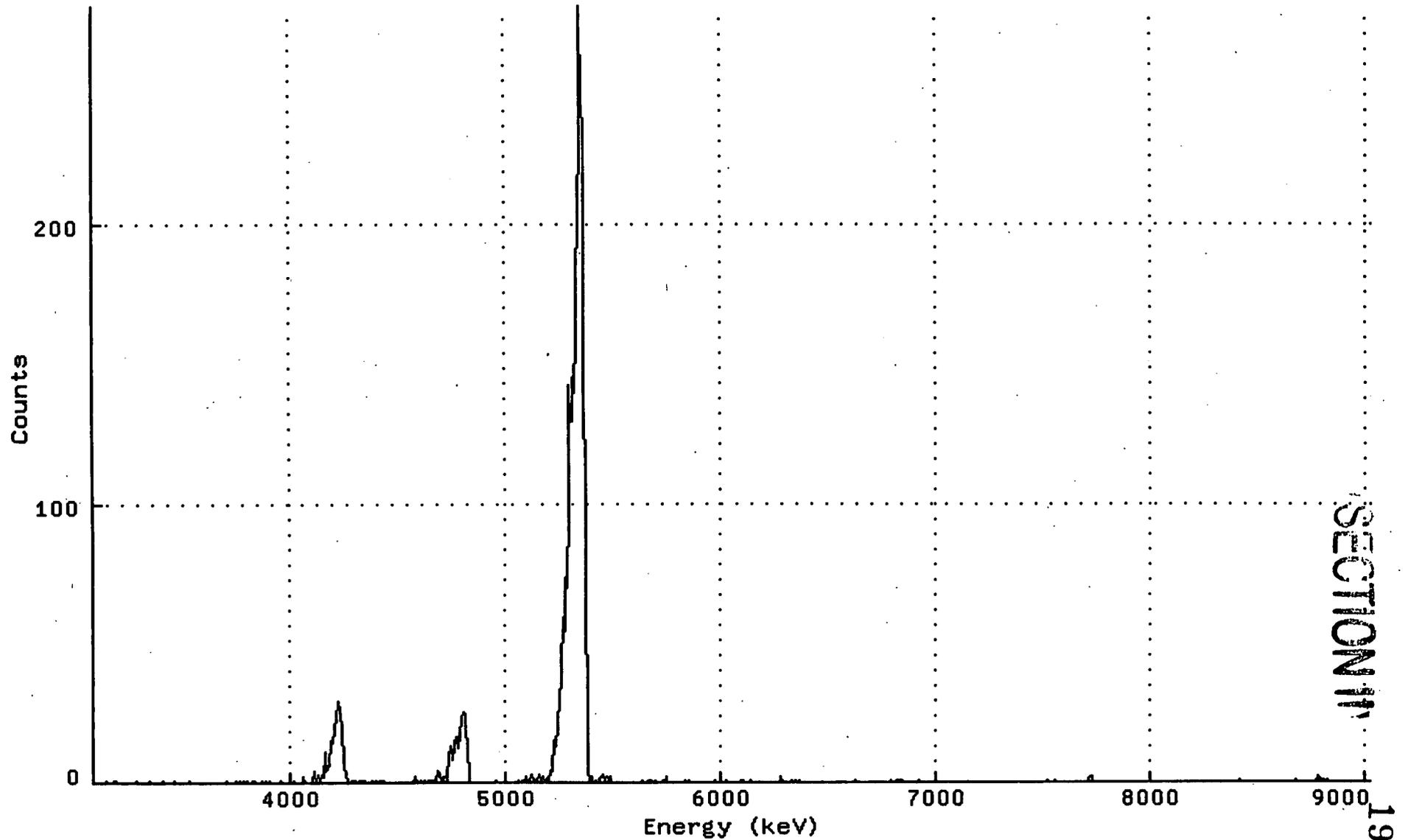
Title : 027

Sample Title:

Start Time: 7-DEC-1999 10:05: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.06580E+03

Real Time : 0 22:13:23.00 Sample ID : 263925 Energy Slope : 5.80855E+00

Live Time : 0 22:13:23.00 Sample Type: UU Energy Quad : 0.00000E+00



362

190

 Spectral File: ND_AMS_ARCHIVE_S:S_99126524\$263926_UU.CNF

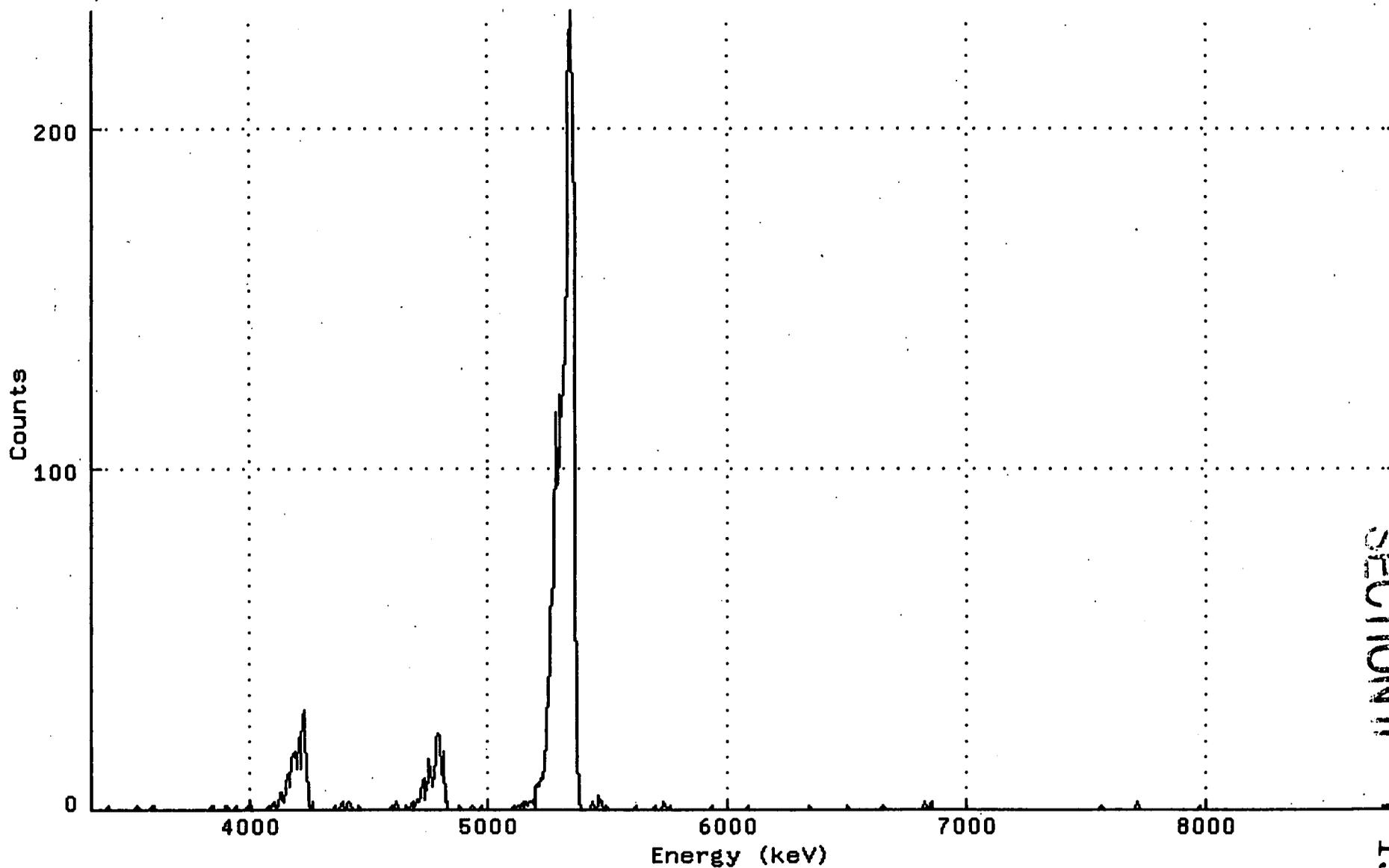
BATCH ID:	99126524	*	SAMPLE ID:	263926
SAMPLE DATE:	29-NOV-1999 00:00	•	ALIQUOT:	4.940E-02 SA
SAMPLE TITLE:		*	DETECTOR NUMBER:	028
ACQ DATE:	7-DEC-1999 10:05	*	AVERAGE EFFICIENCY:	26.5%
ELAPSED LIVE TIME:	80001.	*	RECOVERY:	78.50%
TRACER ID:	U232-178-06-3	*	TRACER FWHM (kev):	62.48
LAMBDA VALUE:	100.	*	ROI TYPE:	MANUAL
CORRECTED TRACER DPM:	10.570	*	CONFIDENCE LEVEL:	4.65
SAMPLE MATRIX:	MISC	*	LLD CONSTANT:	2.71
ENERGY CAL DATE:	3-DEC-1999 06:36	*	EFF CAL DATE:	3-DEC-1999 06:36
BKG FILENAME:	B_028_3DEC99	*		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/	TPU/ERROR SA 2-SIGMA	MDC dpm/ SA	CRIT LEVEL dpm/ SA
U232	5302.5	2924.00	4.00	99.8	2.140E+02	9.591E+00	8.786E-01	5.385E-01
U-234	4761.5	246.00	4.00	99.8	1.800E+01	2.499E+00	8.786E-01	5.385E-01
U-235	4385.5	7.40	3.60	80.9	6.679E-01	6.376E-01	1.041E+00	6.427E-01
U-238	4184.4	296.00	6.00	100.2	2.156E+01	2.774E+00	1.027E+00	6.123E-01

*** POSITIVE ***
 *** RECOUNT SAMPLE CL > 0.500 ***

Spectrum : WIZARD\$DKC200:[ALPHA.ALUSR.ARCHIVE.S]S_99126524\$263926_UU.CNF; 2
Title : 028
Sample Title:
Start Time: 7-DEC-1999 10:05: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.32818E+03
Real Time : 0 22:13:21.00 Sample ID : 263926 Energy Slope : 5.30673E+00
Live Time : 0 22:13:21.00 Sample Type: UU Energy Quad : 0.00000E+00



SECTION II

192

364

SECTION II

 Spectral File: ND_AMS_ARCHIVE S:S_99126524\$263927_UU.CNF

BATCH ID:	99126524	*	SAMPLE ID:	263927
SAMPLE DATE:	29-NOV-1999 00:00	*	ALIQUOT:	5.500E-02 SA
SAMPLE TITLE:		*	DETECTOR NUMBER:	030
ACQ DATE:	7-DEC-1999 10:08	*	AVERAGE EFFICIENCY:	25.9%
ELAPSED LIVE TIME:	80008.	*	RECOVERY:	74.58%
TRACER ID:	U232-178-06-3	*	TRACER FWHM (kev):	75.50
LAMBDA VALUE:	100.	*	ROI TYPE:	MANUAL
CORRECTED TRACER DPM:	10.570	*	CONFIDENCE LEVEL:	4.65
SAMPLE MATRIX:	MISC	*	LLD CONSTANT:	2.71
ENERGY CAL DATE:	3-DEC-1999 06:37	*	EFF CAL DATE:	3-DEC-1999 06:37
BKG FILENAME:	B_030_3DEC99	*		

NUCLIDE ACTIVITY SUMMARY

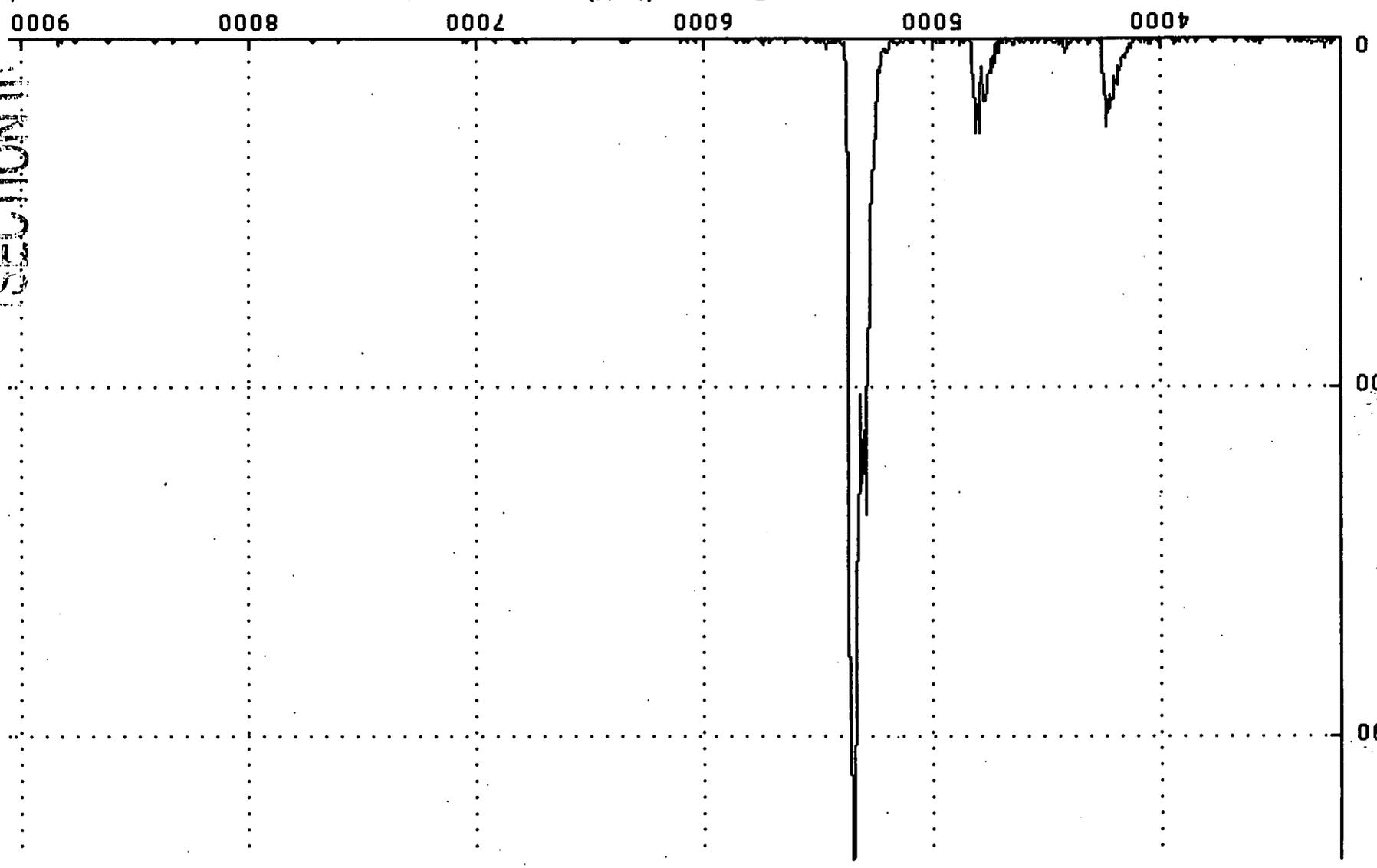
NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/SA	TPU/ERROR 2-SIGMA	MDC dpm/SA	CRIT LEVEL dpm/SA
U232	5302.5	2711.40	3.60	99.8	1.922E+02	8.863E+00	8.173E-01	5.047E-01
U-234	4761.5	269.20	2.80	99.8	1.908E+01	2.549E+00	7.434E-01	4.677E-01
U-235	4385.5	16.00	8.00	80.9	1.399E+00	9.148E-01	1.387E+00	8.118E-01
U-238	4184.4	246.20	4.80	100.2	1.737E+01	2.424E+00	9.101E-01	5.506E-01

*** POSITIVE ***
 *** RECOUNT SAMPLE CL > 0.500 ***

366

SECTION 194

Energy (keV)



Spectrum : WIZARD\$DKC200:[ALPHA,ALUSR,ARCHIVE,S]S-99126524\$263927-UU,CNF;2
 Title : 030
 Sample Title:
 Start time: 7-DEC-1999 10:08: Sample time: 29-NOV-1999 00:00 Energy Offset: 3.19240E+03
 Real time : 0 22:13:28.00 Sample ID : 263927 Energy Slope : 6.71731E+00
 Live time : 0 22:13:28.00 Sample type: UU Energy Quad : 0.00000E+00

 Spectral File: ND_AMS_ARCHIVE_S:S_99126524\$263928_UU.CNF

BATCH ID:	99126524	SAMPLE ID:	263928
SAMPLE DATE:	29-NOV-1999 00:00	ALIQUOT:	3.530E-02 SA
SAMPLE TITLE:		DETECTOR NUMBER:	004
ACQ DATE:	10-DEC-1999 09:48	AVERAGE EFFICIENCY:	25.5%
ELAPSED LIVE TIME:	80001.	RECOVERY:	80.66%
TRACER ID:	U232-178-06-3	TRACER FWHM (kev):	83.39
LAMBDA VALUE:	100.	ROI TYPE:	MANUAL
CORRECTED TRACER DPM:	10.570	CONFIDENCE LEVEL:	4.65
SAMPLE MATRIX:	MISC	LLD CONSTANT:	2.71
ENERGY CAL DATE:	3-DEC-1999 06:15	EFF CAL DATE:	3-DEC-1999 06:15
BKG FILENAME:	B_004_3DEC99		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/SA	TPU/ERROR 2-SIGMA	MDC dpm/SA	CRIT LEVEL dpm/SA
U232	5302.5	2897.40	7.60	99.8	2.994E+02	1.348E+01	1.604E+00	9.422E-01
U-234	4761.5	399.00	2.00	99.8	4.122E+01	4.657E+00	9.594E-01	6.197E-01
U-235	4385.5	27.60	4.40	80.9	3.518E+00	1.492E+00	1.589E+00	9.670E-01
U-238	4184.4	404.00	4.00	100.2	4.156E+01	4.684E+00	1.235E+00	7.571E-01

*** POSITIVE ***
 *** RECOUNT SAMPLE CL > 0.500 ***

Spectrum : WIZARD\$DKC200: [ALPHA.ALUSR.ARCHIVE.S]S_99126524\$263928_UU.CNF; 3

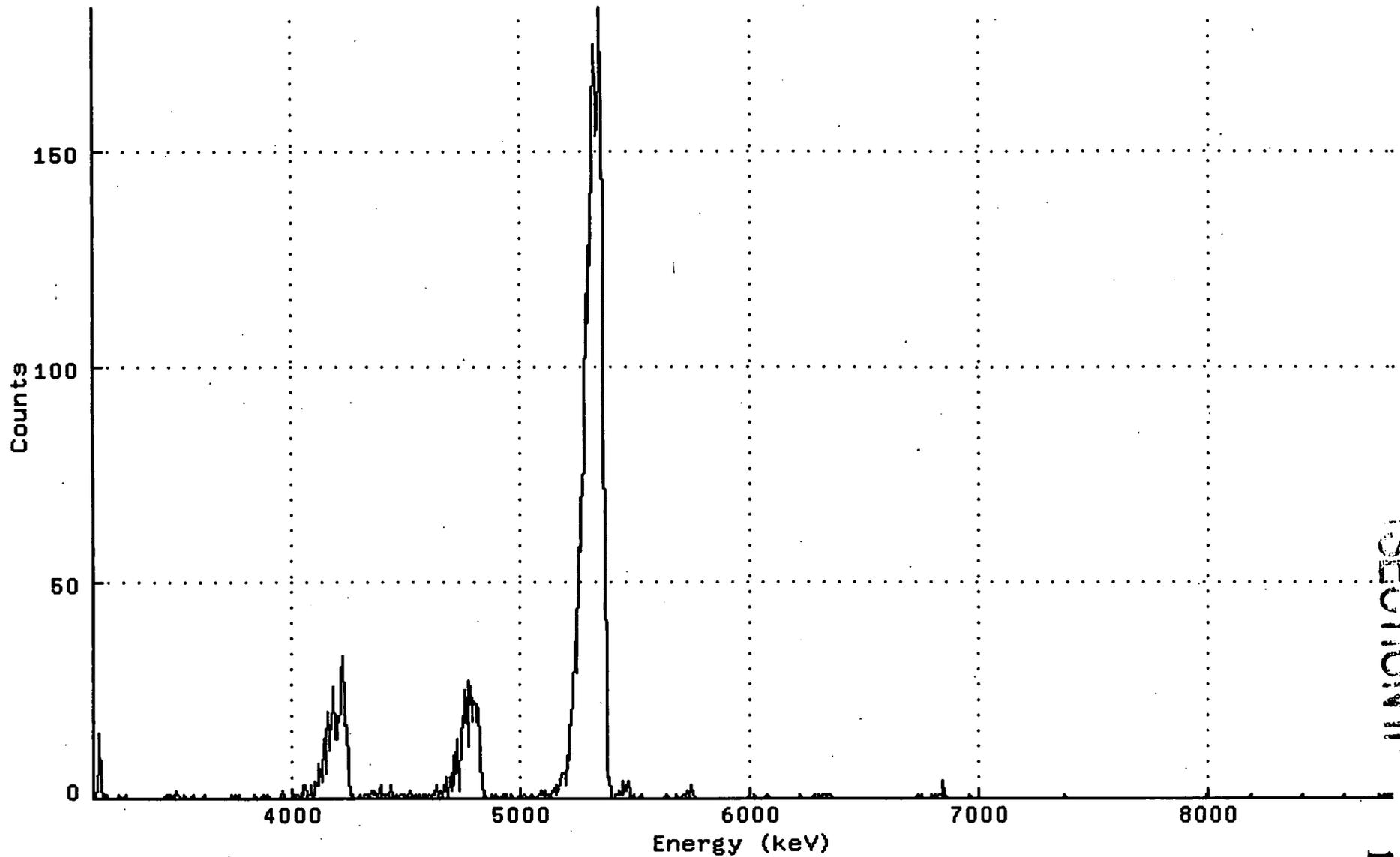
Title : 004

Sample Title:

Start Time: 10-DEC-1999 09:48 Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.12078E+03

Real Time : 0 22:13:22.00 Sample ID : 263928 Energy Slope : 5.54295E+00

Live Time : 0 22:13:21.00 Sample Type: UU Energy Quad : 0.00000E+00



SECTION II

368

196

Spectral File: ND_AMS_ARCHIVE_S:S_99126524\$263929_UU.CNF

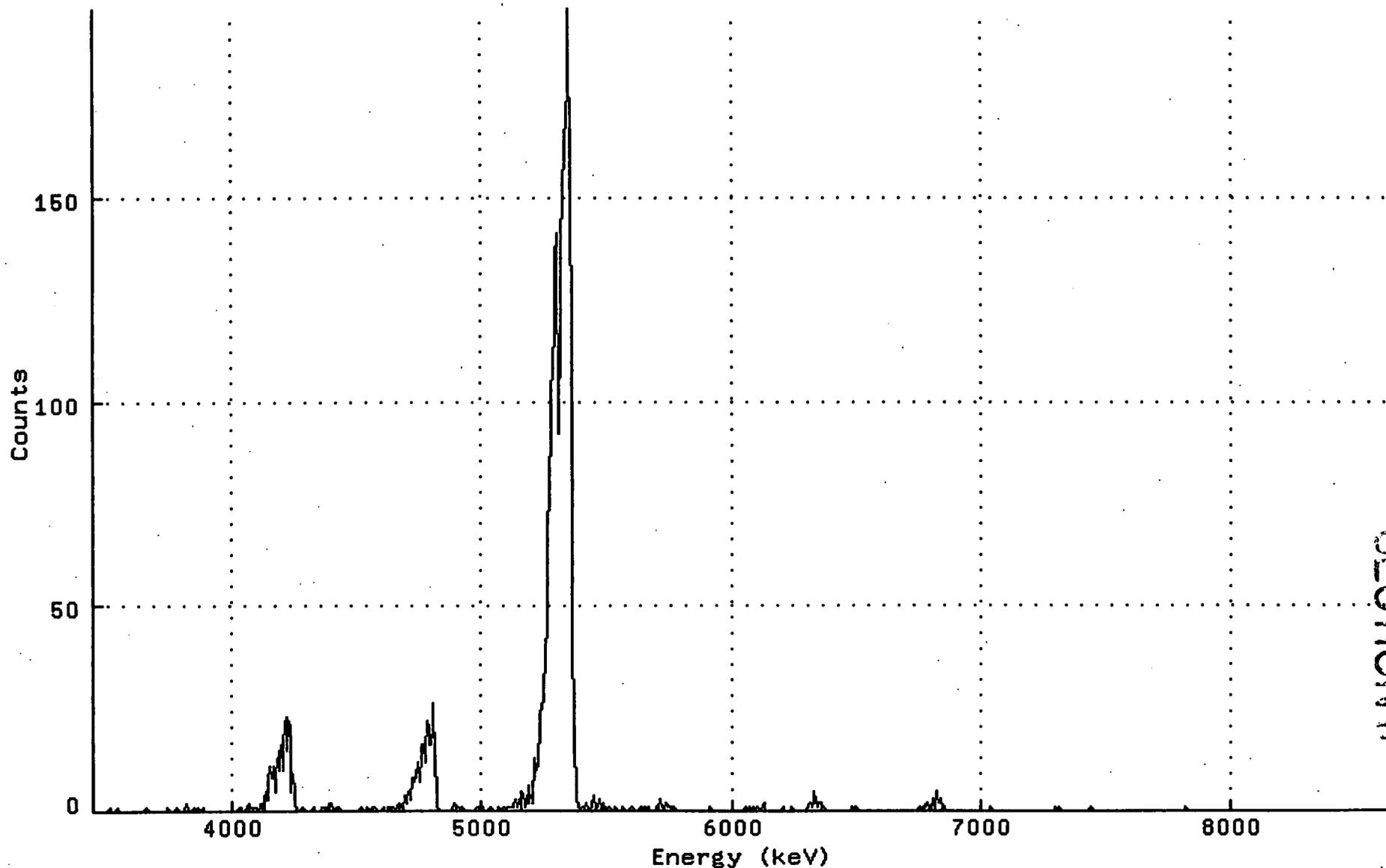
BATCH ID:	99126524	SAMPLE ID:	263929
SAMPLE DATE:	29-NOV-1999 00:00	ALIQOT:	2.850E-02 SA
SAMPLE TITLE:		DETECTOR NUMBER:	032
ACQ DATE:	7-DEC-1999 10:08	AVERAGE EFFICIENCY:	25.4%
ELAPSED LIVE TIME:	80004.	RECOVERY:	79.13%
TRACER ID:	U232-178-06-3	TRACER FWHM (kev):	77.77
LAMBDA VALUE:	100.	ROI TYPE:	MANUAL
CORRECTED TRACER DPM:	10.570	CONFIDENCE LEVEL:	4.65
SAMPLE MATRIX:	MISC	LLD CONSTANT:	2.71
ENERGY CAL DATE:	3-DEC-1999 06:41	EFF CAL DATE:	3-DEC-1999 06:41
BKG FILENAME:	B_032_3DEC99		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/SA	TPU/ERROR 2-SIGMA	MDC dpm/SA	CRIT LEVEL dpm/SA
U232	5302.5	2829.80	5.20	99.8	3.709E+02	1.684E+01	1.745E+00	1.050E+00
U-234	4761.5	297.60	4.40	99.8	3.900E+01	4.997E+00	1.633E+00	9.941E-01
U-235	4385.5	10.80	5.20	80.9	1.746E+00	1.378E+00	2.152E+00	1.295E+00
U-238	4184.4	281.20	2.80	100.2	3.669E+01	4.801E+00	1.369E+00	8.612E-01

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.500 ***

Spectrum : WIZARD\$DKC200:[ALPHA.ALUSR.ARCHIVE.S]S_99126524\$263929_UU.CNF; 2
Title : 032
Sample Title:
Start Time: 7-DEC-1999 10:08: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.43333E+03
Real Time : 0 22:13:24.00 Sample ID : 263929 Energy Slope : 5.07570E+00
Live Time : 0 22:13:24.00 Sample Type: UU Energy Quad : 0.00000E+00



SECTION 11

193

370

 Spectral File: ND_AMS_ARCHIVE_S:S_99126524\$263930_UU.CNF

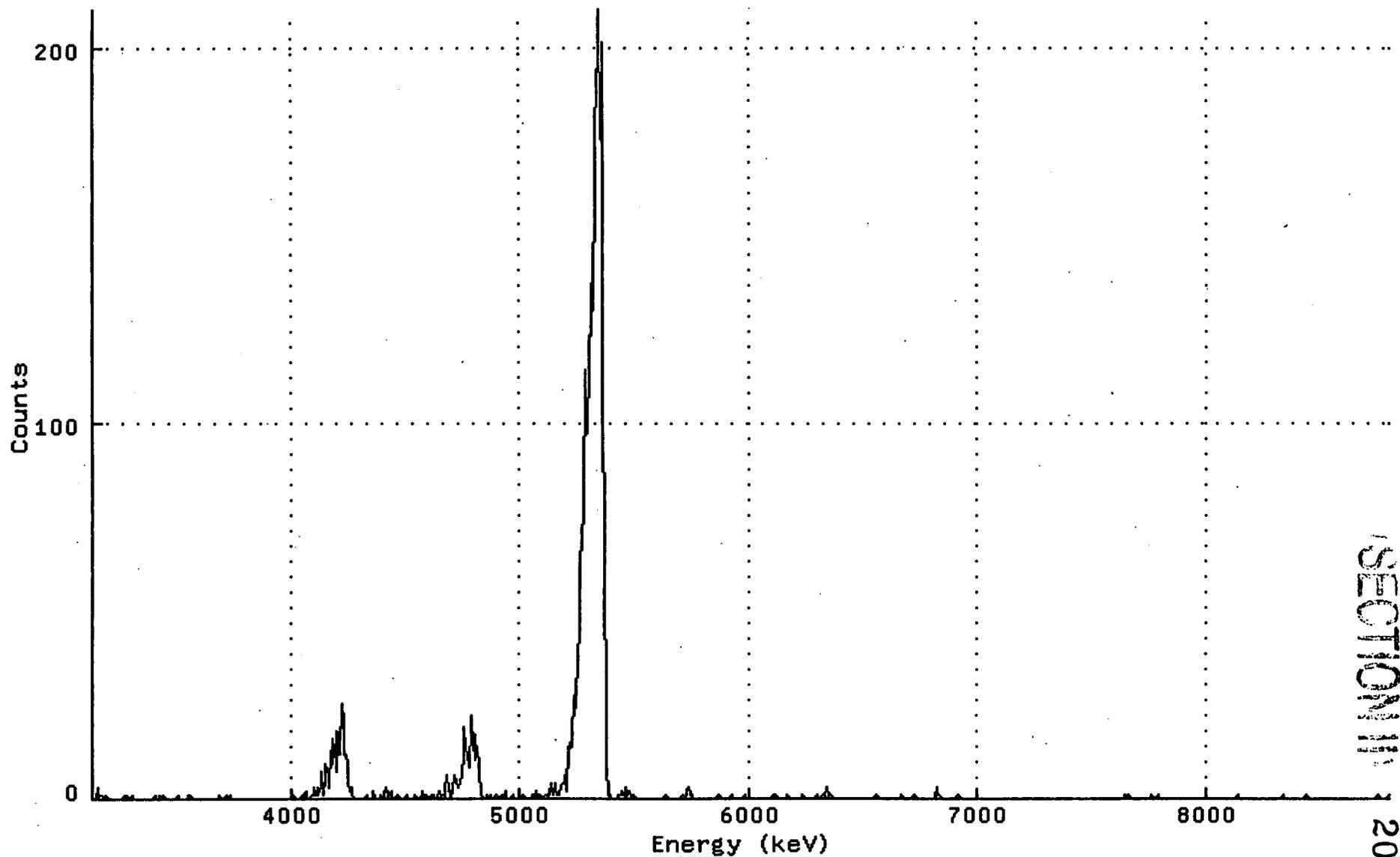
BATCH ID:	99126524	SAMPLE ID:	263930
SAMPLE DATE:	29-NOV-1999 00:00	ALIQUOT:	4.880E-02 SA
SAMPLE TITLE:		DETECTOR NUMBER:	004
ACQ DATE:	8-DEC-1999 09:59	AVERAGE EFFICIENCY:	25.5%
ELAPSED LIVE TIME:	80003.	RECOVERY:	80.22%
TRACER ID:	U232-178-06-3	TRACER FWHM (kev):	79.55
LAMBDA VALUE:	100.	ROI TYPE:	MANUAL
CORRECTED TRACER DPM:	10.570	CONFIDENCE LEVEL:	4.65
SAMPLE MATRIX:	MISC	LLD CONSTANT:	2.71
ENERGY CAL DATE:	3-DEC-1999 06:15	EFF CAL DATE:	3-DEC-1999 06:15
BKG FILENAME:	B_004_3DEC99		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/SA	TPU/ERROR 2-SIGMA	MDC dpm/SA	CRIT LEVEL dpm/SA
U232	5302.5	2882.00	6.00	99.8	2.166E+02	9.763E+00	1.059E+00	6.315E-01
U-234	4761.5	239.00	2.00	99.8	1.796E+01	2.514E+00	6.977E-01	4.507E-01
U-235	4385.5	10.60	4.40	80.9	9.825E-01	7.606E-01	1.155E+00	7.032E-01
U-238	4184.4	261.80	5.20	100.2	1.959E+01	2.655E+00	9.961E-01	5.994E-01

*** POSITIVE ***
 *** RECOUNT SAMPLE CL > 0.500 ***

Spectrum : WIZARD\$DKC200: [ALPHA.ALUSR.ARCHIVE.S]S_99126524\$263930_UU.CNF; 2
Title : 004
Sample Title:
Start Time: 8-DEC-1999 09:59: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.12078E+03
Real Time : 0 22:13:23.00 Sample ID : 263930 Energy Slope : 5.54295E+00
Live Time : 0 22:13:23.00 Sample Type: UU Energy Quad : 0.00000E+00



SECTION 11 200

372

Spectral File: ND_AMS_ARCHIVE_S:S_99126524\$263921D_UU.CNF

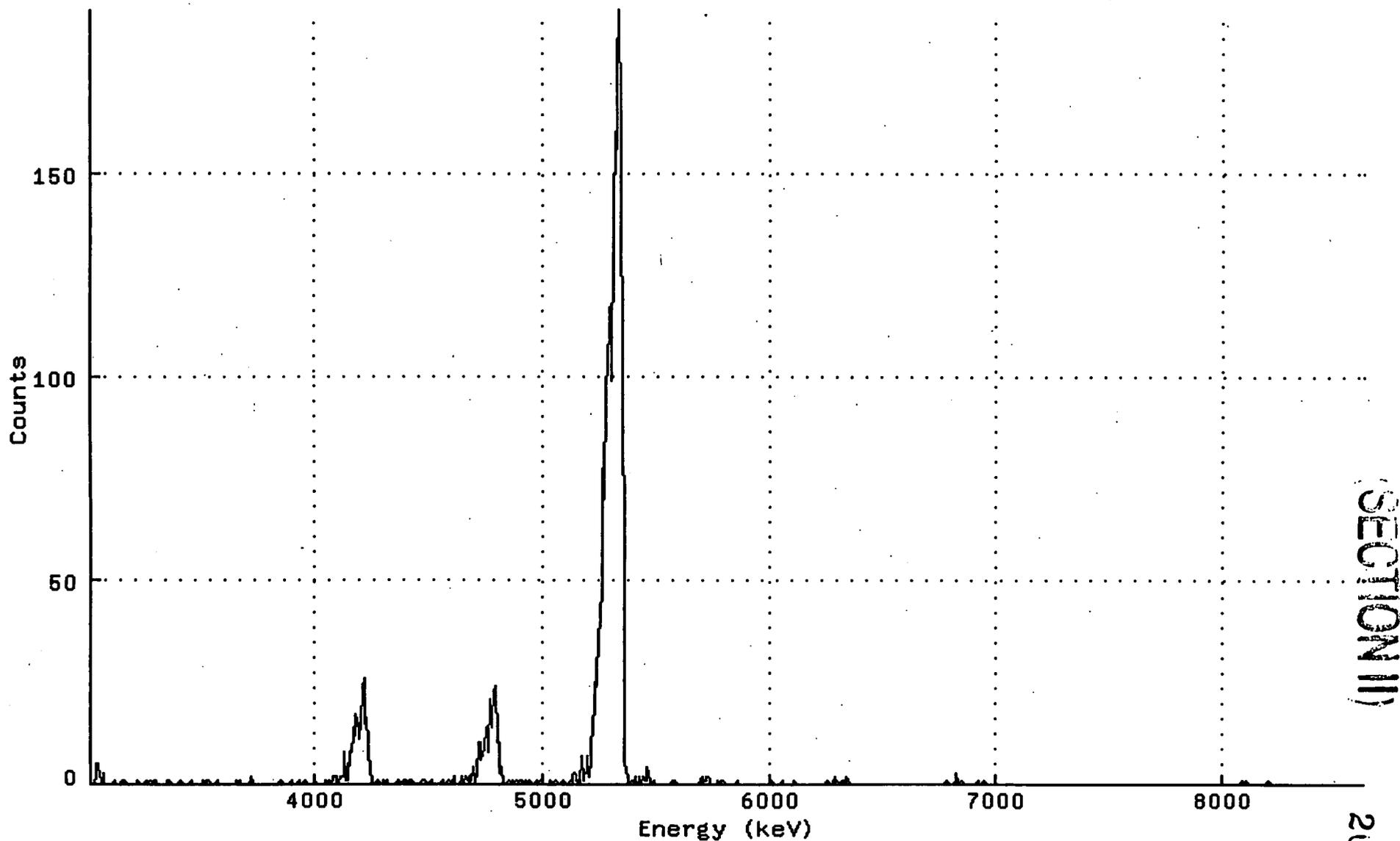
BATCH ID: 99126524 * SAMPLE ID: 263921D
SAMPLE DATE: 29-NOV-1999 00:00 * ALIQUOT: 3.930E-02 SA
SAMPLE TITLE: * DETECTOR NUMBER: 005
ACQ DATE: 8-DEC-1999 10:00 * AVERAGE EFFICIENCY: 24.8%
ELAPSED LIVE TIME: 80000. * RECOVERY: 71.09%
TRACER ID: U232-178-06-3 * TRACER FWHM (kev): 78.28
LAMBDA VALUE: 100. * ROI TYPE: MANUAL
CORRECTED TRACER DPM: 10.570 * CONFIDENCE LEVEL: 4.65
SAMPLE MATRIX: MISC * LLD CONSTANT: 2.71
ENERGY CAL DATE: 3-DEC-1999 06:17 * EFF CAL DATE: 3-DEC-1999 06:17
BKG FILENAME: B_005_3DEC99 *

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/SA	TPU/ERROR 2-SIGMA	MDC dpm/SA	CRIT LEVEL dpm/SA
U232	5302.5	2477.00	6.00	99.8	2.690E+02	1.279E+01	1.531E+00	9.124E-01
U-234	4761.5	249.00	4.00	99.8	2.703E+01	3.758E+00	1.304E+00	7.990E-01
U-235	4385.5	9.40	3.60	80.9	1.259E+00	1.020E+00	1.544E+00	9.537E-01
U-238	4184.4	252.80	3.20	100.2	2.732E+01	3.767E+00	1.192E+00	7.425E-01

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.500 ***

Spectrum : WIZARD\$DKC200: [ALPHA.ALUSR.ARCHIVE.S]S_99126524\$263921D_UU.CNF; 2
Title : 005
Sample Title:
Start Time: 8-DEC-1999 10:00: Sample Time: 29-NOV-1999 00:00 Energy Offset: 2.99915E+03
Real Time : 0 22:13:20.00 Sample ID : 263921D Energy Slope : 5.48330E+00
Live Time : 0 22:13:20.00 Sample Type: UU Energy Quad : 0.00000E+00



SECTION II)

202

374

Spectral File: ND_AMS_ARCHIVE_C:C_99126524\$LCSWR1_UU.CNF

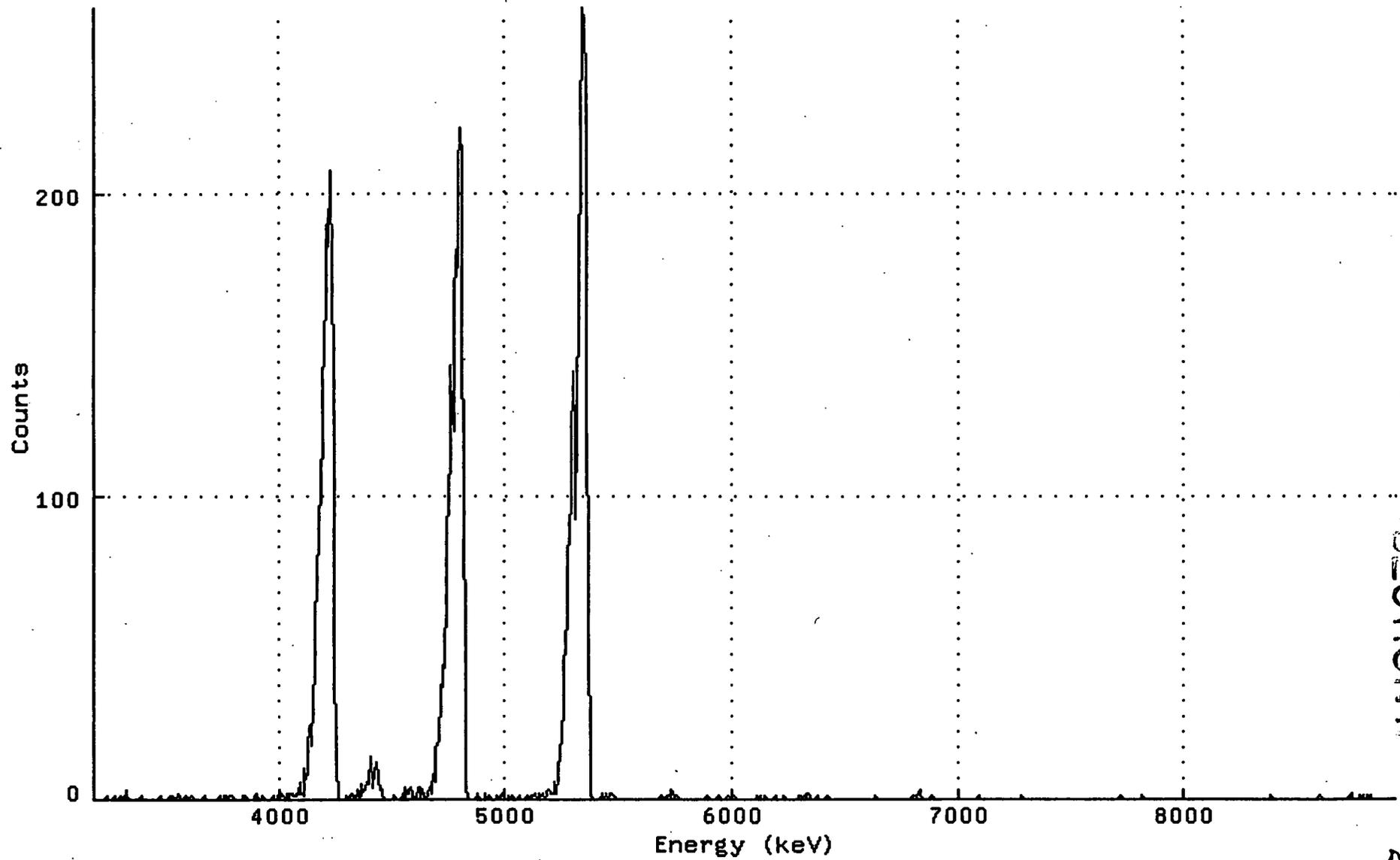
BATCH ID: 99126524 * SAMPLE ID: LCSWR1 *
SAMPLE DATE: 29-NOV-1999 00:00 * ALIQUOT: 2.500E-01 L *
SAMPLE TITLE: * DETECTOR NUMBER: 014 *
ACQ DATE: 8-DEC-1999 10:00 * AVERAGE EFFICIENCY: 26.1% *
ELAPSED LIVE TIME: 80000. * RECOVERY: 77.99% *
TRACER ID: U232-178-06-3 * TRACER FWHM (kev): 64.86 *
LAMBDA VALUE: 100. * ROI TYPE: MANUAL *
CORRECTED TRACER DPM: 10.570 * CONFIDENCE LEVEL: 4.65 *
SAMPLE MATRIX: MISC * LLD CONSTANT: 2.71 *
ENERGY CAL DATE: 3-DEC-1999 06:21 * EFF CAL DATE: 3-DEC-1999 06:21 *
BKG FILENAME: B_014_3DEC99 *

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY pCi/	TPU/ERROR L	MDC pCi/	CRIT LEVEL L
U232	5302.5	2866.40	19.60	99.8	1.905E+01	8.614E-01	1.547E-01	8.637E-02
U-234	4761.5	2474.00	10.00	99.8	1.643E+01	1.079E+00	1.157E-01	6.684E-02
U-235	4385.5	121.40	7.60	80.9	9.948E-01	1.952E-01	1.273E-01	7.473E-02
U-238	4184.4	2344.00	8.00	100.2	1.550E+01	1.028E+00	1.049E-01	6.142E-02

*** POSITIVE ***

Spectrum : WIZARD\$DKC200: [ALPHA.ALUSR.ARCHIVE.C]C_99126524\$LCSWR1_UU.CNF; 2
Title : 014
Sample Title:
Start Time: 8-DEC-1999 10:00: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.16850E+03
Real Time : 0 22:13:21.00 Sample ID : LCSWR1 Energy Slope : 5.62876E+00
Live Time : 0 22:13:20.00 Sample Type: UU Energy Quad : 0.00000E+00



SECTION 11

204

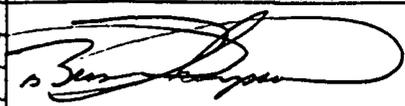
376

Sample Preparation and Analysis Log

SECTION II

205

Sample Type: Various Solids

Method	Isotopes	Worklist Names	Chemist	Date	
Digestion & Purification	RC-19 R06	Am-241	99126525		12/7/99
		Pu-239/240, Pu-238	99126526		
		U-238, U235, U234	99126527		
Counting	RC-19 R06	U ²³⁵	99126527		12/10/99

Tracers (Internal Standards)

Isotope	ID	Conc(pCi/mL) @ RD	Aliquot(mL)	HL (years)	Activity(dpm)	Activity(pCi)
U-232	178-06-3	50.91	12/15/92	0.100	72	10.57
Am-243	82-76-2	50.80	12/15/92	0.100	7380	11.27
Pu-242	82-76-1	41.60	12/18/89	0.100	3.758E+05	9.24

Req	Sample ID	#	Aliquot Size	Comments/ Analysis	Sample Aliquot	Detector Number	Tare Weight(g)	Sample & Container(g)	Total Sample Size (g)
	PB	1	1 SA			15			
16848	263931	2	0.500 G		0.0631	17	14.612	22.537	7.925
16848	263932	3	0.500 G		0.0279	18	14.656	32.546	17.890
16848	263933	4	0.500 G		0.0418	21	14.692	26.665	11.973
16848	263934	5	0.500 G		0.0391	22	14.616	27.414	12.798
16848	263935	6	0.500 G		0.0328	23	14.529	29.793	15.264
16848	263936	7	0.500 G		0.0453	27	14.562	25.595	11.033
16848	263937	8	0.500 G		0.0389	28	14.530	27.384	12.854
16848	263938	9	0.500 G		0.0636	30	14.670	22.536	7.866
16848	263939	10	0.500 G		0.0461	31	14.535	25.378	10.843
16848	263940	11	0.500 G		0.0667	32	14.642	22.133	7.491
16848	263941	12	0.500 G		0.0376	5	14.702	27.993	13.291
16848	263942	13	0.500 G		0.0373	14	14.551	27.966	13.415
16848	263943	14	0.500 G		0.0523	15	14.562	24.115	9.553
16848	263944	15	0.500 G		0.0324	17	14.679	30.113	15.434
16848	263931D	16	0.500 G		0.0631	18	14.612	22.537	7.925
	LCSWR1, LCSWR33	17	0.250 mL			21			
		18							
		19							
		20							
		21							
		22							
		23							
		24							
		25							
		26							
		27							
		28							
		29							
		30							

Comments and Actual conditions:

- Start date: 12/1/99
- Automatic pipets calibrated in accord with QC-6 on balance # 15
- Balance # 5 used for weights of samples and their aliquots
- Sample aliquot is the fraction of the total sample taken for analysis

OK
12-13-99
Qcda
S. Lopez
12/13/99

 Spectral File: ND_AMS_ARCHIVE_R:R_99126527\$PB_UU.CNF

BATCH ID:	99126527	*	SAMPLE ID:	PB
SAMPLE DATE:	29-NOV-1999 00:00	*	ALIQUOT:	1.000E+00 SA
SAMPLE TITLE:		*	DETECTOR NUMBER:	015
ACQ DATE:	8-DEC-1999 10:01	*	AVERAGE EFFICIENCY:	26.1%
ELAPSED LIVE TIME:	80002.	*	RECOVERY:	84.38%
TRACER ID:	U232-178-06-3	*	TRACER FWHM (kev):	62.69
LAMBDA VALUE:	100.	*	ROI TYPE:	STANDARD
CORRECTED TRACER DPM:	10.570	•	CONFIDENCE LEVEL:	4.65
SAMPLE MATRIX:	MISC	*	LLD CONSTANT:	2.71
ENERGY CAL DATE:	3-DEC-1999 06:23	•	EFF CAL DATE:	3-DEC-1999 06:23
BKG FILENAME:	B_015_3DEC99	*		

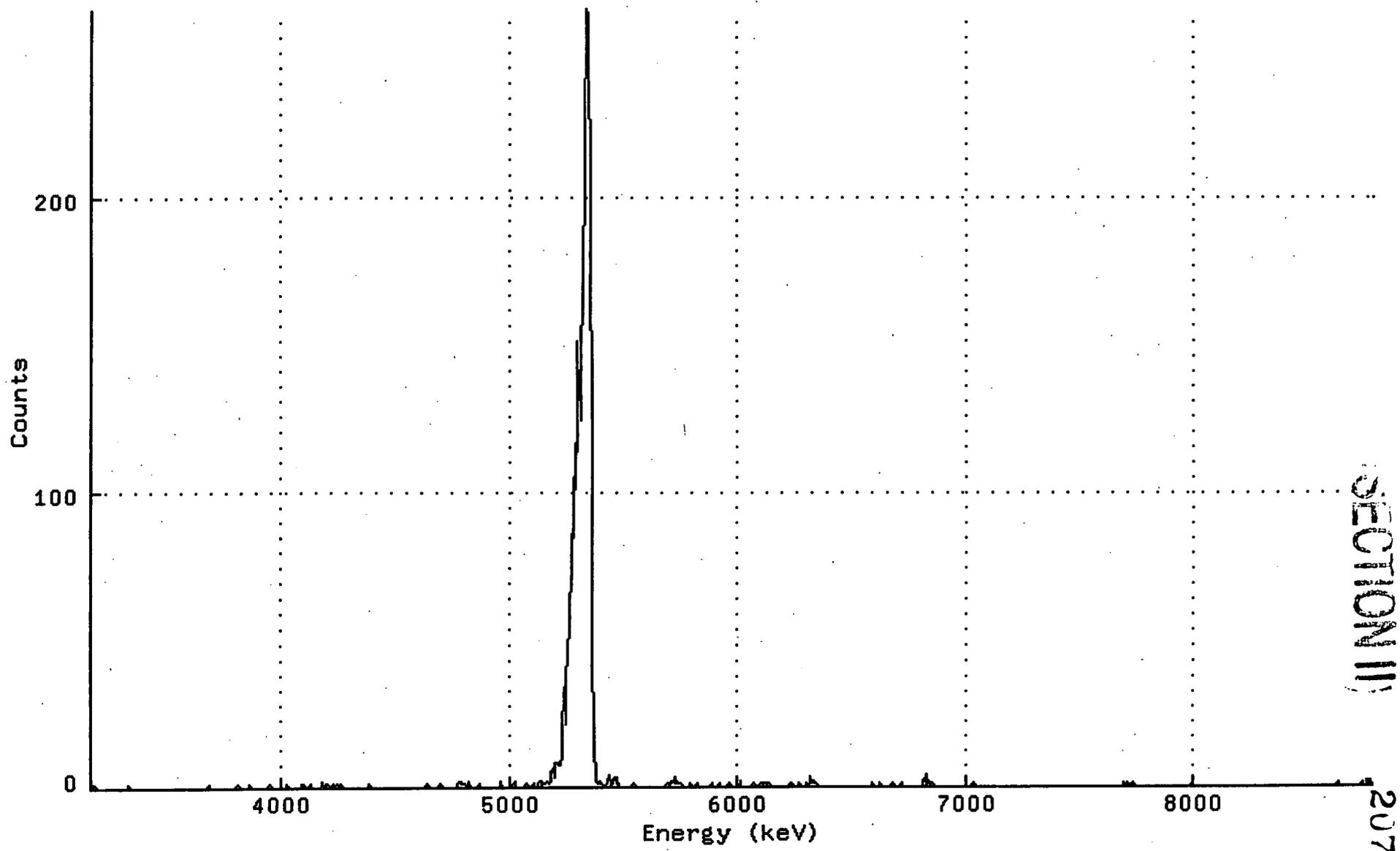
 NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/	TPU/ERROR SA 2-SIGMA	MDC dpm/	CRIT LEVEL SA dpm/
U232	5302.5	3098.40	7.60	99.8	1.057E+01	4.655E-01	5.296E-02	3.110E-02
U-234	4761.5	10.20	2.80	99.8	3.479E-02	2.569E-02	3.578E-02	2.251E-02
U-235	4385.5	-0.60	1.60	80.9	-2.525E-03	1.078E-02	3.615E-02	2.378E-02
U-238	4184.4	8.80	1.20	100.2	2.988E-02	2.204E-02	2.650E-02	1.785E-02

 *** POSITIVE ***

659

Spectrum : WIZARD\$DKC200: [ALPHA.ALUSR.ARCHIVE.R]R_99126527\$PB_UU.CNF; 2
Title : 015
Sample Title:
Start Time: 8-DEC-1999 10:01: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.11170E+03
Real Time : 0 22:13:22.00 Sample ID : PB Energy Slope : 5.53627E+00
Live Time : 0 22:13:22.00 Sample Type: UU Energy Quad : 0.00000E+00



SECTION II
207

 Spectral File: ND_AMS_ARCHIVE_S:S_99126527\$263931_UU.CNF

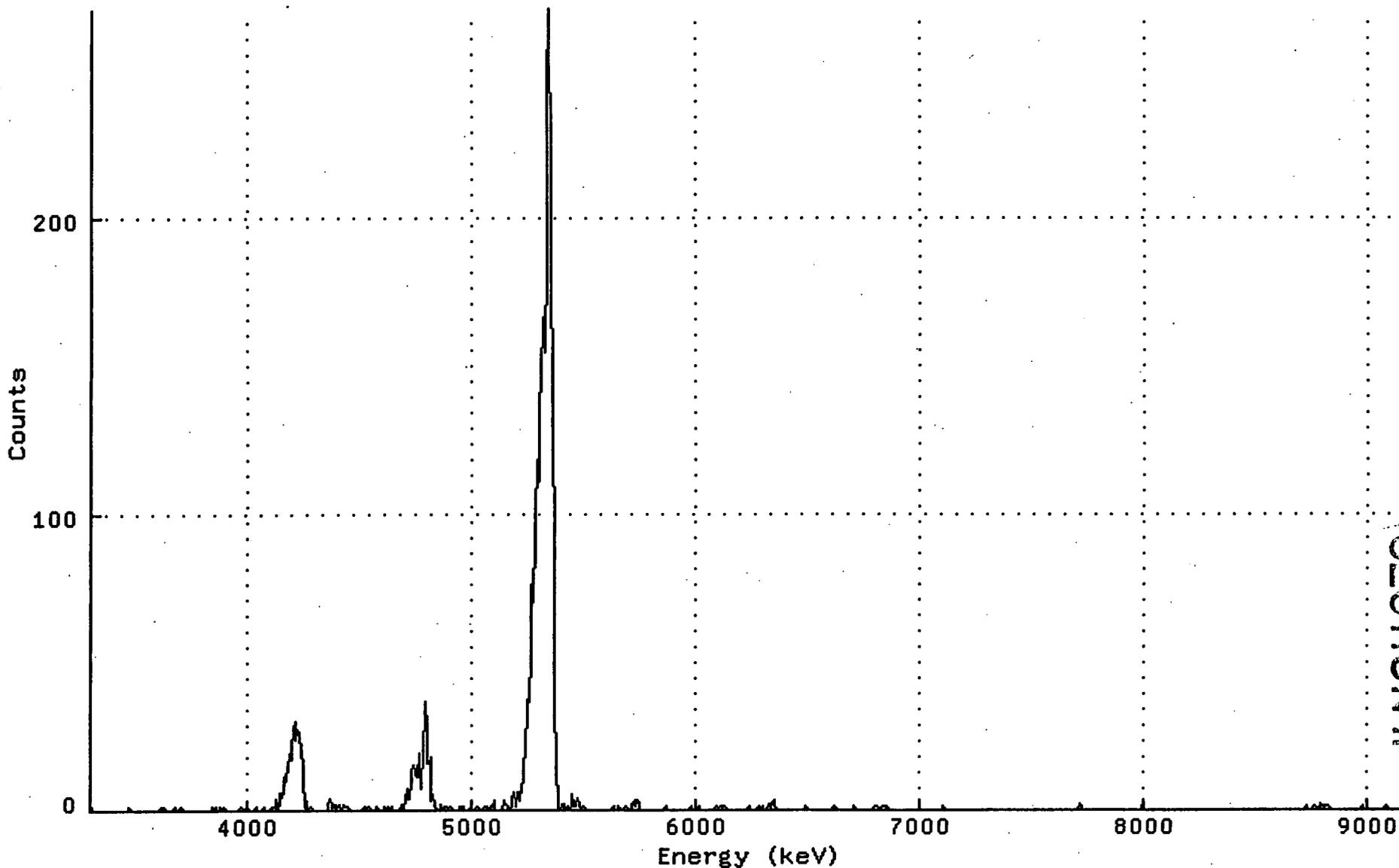
BATCH ID:	99126527	SAMPLE ID:	263931
SAMPLE DATE:	29-NOV-1999 00:00	ALIQUOT:	6.310E-02 SA
SAMPLE TITLE:		DETECTOR NUMBER:	017
ACQ DATE:	8-DEC-1999 10:01	AVERAGE EFFICIENCY:	26.1%
ELAPSED LIVE TIME:	80005.	RECOVERY:	80.04%
TRACER ID:	U232-178-06-3	TRACER FWHM (kev):	57.17
LAMBDA VALUE:	100.	ROI TYPE:	STANDARD
CORRECTED TRACER DPM:	10.570	CONFIDENCE LEVEL:	4.65
SAMPLE MATRIX:	MISC	LLD CONSTANT:	2.71
ENERGY CAL DATE:	3-DEC-1999 06:24	EFF CAL DATE:	3-DEC-1999 06:24
BKG FILENAME:	B_017_3DEC99		

 NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/SA	TPU/ERROR 2-SIGMA	MDC dpm/SA	CRIT LEVEL dpm/SA
U232	5302.5	2942.60	6.40	99.8	1.675E+02	7.512E+00	8.237E-01	4.890E-01
U-234	4761.5	295.60	4.40	99.8	1.682E+01	2.159E+00	7.094E-01	4.318E-01
U-235	4385.5	17.00	6.00	80.9	1.194E+00	7.104E-01	9.900E-01	5.901E-01
U-238	4184.4	340.40	1.60	100.2	1.929E+01	2.322E+00	4.869E-01	3.202E-01

 *** POSITIVE ***
 *** RECOUNT SAMPLE CL > 0.500 ***

Spectrum : WIZARD\$DKC200: [ALPHA.ALUSR.ARCHIVE.S]S_99126527\$263931_UU.CNF; 2
Title : 017
Sample Title:
Start Time: 8-DEC-1999 10:01: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.24209E+03
Real Time : 0 22:13:25.00 Sample ID : 263931 Energy Slope : 5.79799E+00
Live Time : 0 22:13:25.00 Sample Type: UU Energy Quad : 0.00000E+00



SECTION III
209

SECTION III

Spectral File: ND_AMS_ARCHIVE_S:S_99126527\$263932_UU.CNF

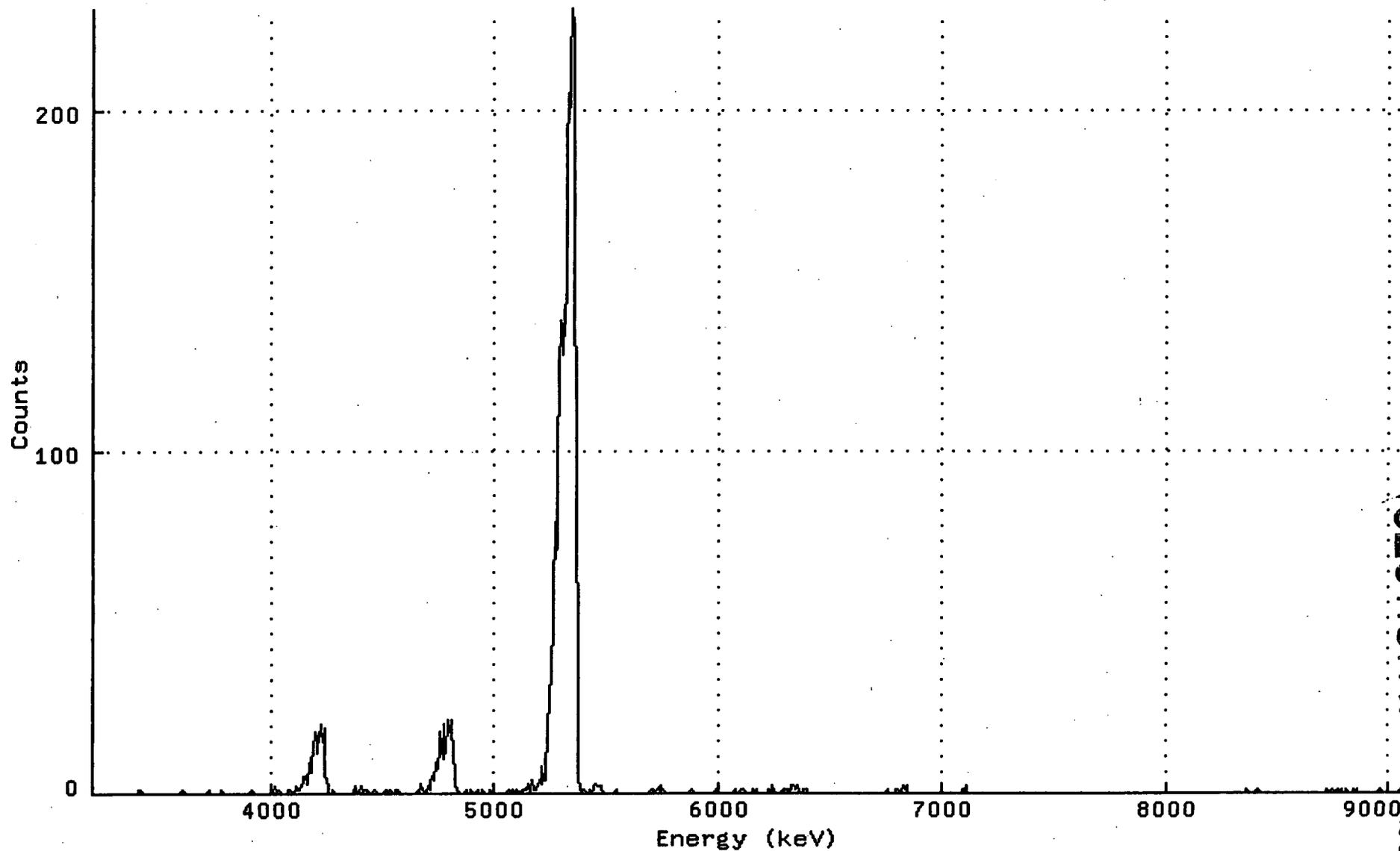
BATCH ID:	99126527	SAMPLE ID:	263932
SAMPLE DATE:	29-NOV-1999 00:00	ALIQOT:	2.790E-02 SA
SAMPLE TITLE:		DETECTOR NUMBER:	018
ACQ DATE:	8-DEC-1999 10:02	AVERAGE EFFICIENCY:	26.1%
ELAPSED LIVE TIME:	80005.	RECOVERY:	78.08%
TRACER ID:	U232-178-06-3	TRACER FWHM (kev):	74.96
LAMBDA VALUE:	100.	ROI TYPE:	STANDARD
CORRECTED TRACER DPM:	10.570	CONFIDENCE LEVEL:	4.65
SAMPLE MATRIX:	MISC	LLD CONSTANT:	2.71
ENERGY CAL DATE:	3-DEC-1999 06:26	EFF CAL DATE:	3-DEC-1999 06:26
BKG FILENAME:	B_018_3DEC99		

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/	TPU/ERROR SA 2-SIGMA	MDC dpm/	CRIT LEVEL SA	SA
U232	5302.5	2867.40	3.60	99.8	3.789E+02	1.709E+01	1.523E+00	9.407E-01	
U-234	4761.5	241.80	5.20	99.8	3.194E+01	4.484E+00	1.759E+00	1.058E+00	
U-235	4385.5	10.80	1.20	80.9	1.760E+00	1.155E+00	1.272E+00	8.566E-01	
U-238	4184.4	218.80	1.20	100.2	2.878E+01	4.180E+00	1.026E+00	6.914E-01	

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.500 ***

Spectrum : WIZARD\$DKC200: [ALPHA.ALUSR.ARCHIVE.S]S_99126527\$263932_UU.CNF; 2
Title : 018
Sample Title:
Start Time: 8-DEC-1999 10:02: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.14472E+03
Real Time : 0 22:13:25.00 Sample ID : 263932 Energy Slope : 5.77493E+00
Live Time : 0 22:13:25.00 Sample Type: UU Energy Quad : 0.00000E+00



SECTION III
211

Spectral File: ND_AMS_ARCHIVE_S:S_99126527\$263933_UU.CNF

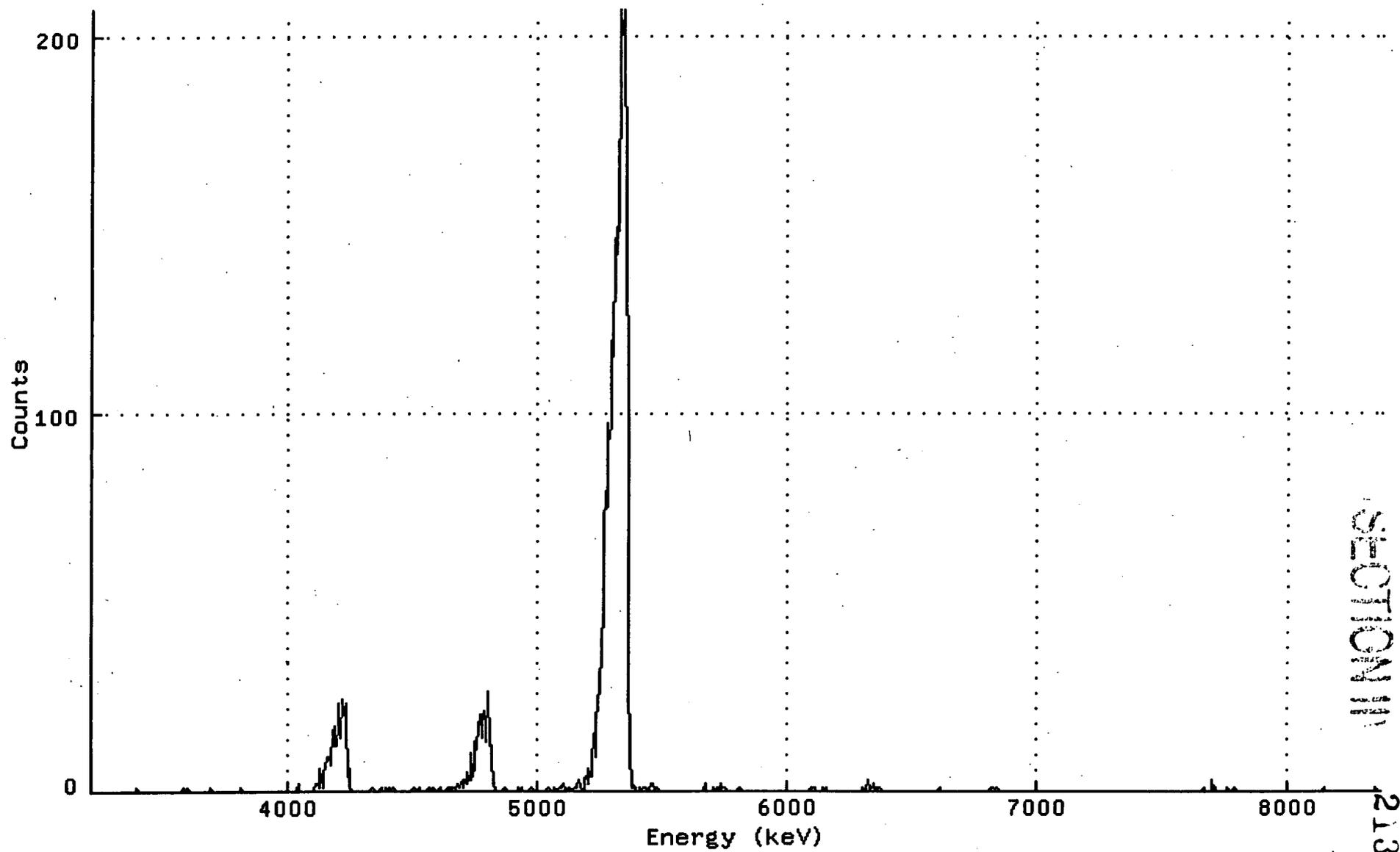
BATCH ID: 99126527 * SAMPLE ID: 263933
SAMPLE DATE: 29-NOV-1999 00:00 * ALIQUOT: 4.180E-02 SA
SAMPLE TITLE: * DETECTOR NUMBER: 021
ACQ DATE: 8-DEC-1999 10:02 * AVERAGE EFFICIENCY: 26.4%
ELAPSED LIVE TIME: 80005. * RECOVERY: 77.16%
TRACER ID: U232-178-06-3 * TRACER FWHM (kev): 63.44
LAMBDA VALUE: 100. * ROI TYPE: STANDARD
CORRECTED TRACER DPM: 10.570 * CONFIDENCE LEVEL: 4.65
SAMPLE MATRIX: MISC * LLD CONSTANT: 2.71
ENERGY CAL DATE: 3-DEC-1999 06:27 * EFF CAL DATE: 3-DEC-1999 06:27
BKG FILENAME: B_021_3DEC99 *

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/SA	TPU/ERROR 2-SIGMA	MDC dpm/SA	CRIT LEVEL dpm/SA
U232	5302.5	2864.00	4.00	99.8	2.529E+02	1.141E+01	1.060E+00	6.497E-01
U-234	4761.5	267.40	3.60	99.8	2.360E+01	3.159E+00	1.018E+00	6.286E-01
U-235	4385.5	6.60	2.40	80.9	7.187E-01	6.883E-01	1.080E+00	6.873E-01
U-238	4184.4	300.20	0.80	100.2	2.639E+01	3.342E+00	6.037E-01	4.210E-01

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.500 ***

Spectrum : WIZARD\$DKC200:[ALPHA.ALUSR.ARCHIVE.S]S_99126527\$263933_UU.CNF; 2
Title : 021
Sample Title:
Start Time: 8-DEC-1999 10:02: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.16443E+03
Real Time : 0 22:13:25.00 Sample ID : 263933 Energy Slope : 5.08660E+00
Live Time : 0 22:13:25.00 Sample Type: UU Energy Quad : 0.00000E+00



SECTION 11

213

 Spectral File: ND_AMS_ARCHIVE_S:S_99126527\$263934_UU.CNF

BATCH ID:	99126527	SAMPLE ID:	263934
SAMPLE DATE:	29-NOV-1999 00:00	ALIQOT:	3.910E-02 SA
SAMPLE TITLE:		DETECTOR NUMBER:	022
ACQ DATE:	8-DEC-1999 10:02	AVERAGE EFFICIENCY:	26.1%
ELAPSED LIVE TIME:	80001.	RECOVERY:	78.13%
TRACER ID:	U232-178-06-3	TRACER FWHM (kev):	40.93
LAMBDA VALUE:	100.	ROI TYPE:	STANDARD
CORRECTED TRACER DPM:	10.570	CONFIDENCE LEVEL:	4.65
SAMPLE MATRIX:	MISC	LLD CONSTANT:	2.71
ENERGY CAL DATE:	3-DEC-1999 06:29	EFF CAL DATE:	3-DEC-1999 06:29
BKG FILENAME:	B_022_3DEC99		

 NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/SA	TPU/ERROR 2-SIGMA	MDC dpm/SA	CRIT LEVEL dpm/SA
U232	5302.5	2870.80	3.20	99.8	2.703E+02	1.222E+01	1.038E+00	6.467E-01
U-234	4761.5	239.40	3.60	99.8	2.254E+01	3.167E+00	1.086E+00	6.704E-01
U-235	4385.5	12.00	2.00	80.9	1.394E+00	8.965E-01	1.078E+00	6.966E-01
U-238	4184.4	252.60	2.40	100.2	2.368E+01	3.241E+00	9.293E-01	5.917E-01

 *** POSITIVE ***
 *** RECOUNT SAMPLE CL > 0.500 ***

Spectrum : WIZARD\$DKC200.L\LPNA.ALUSR.ARCHIVE.SJS_99126527\263934_00.CNF;2

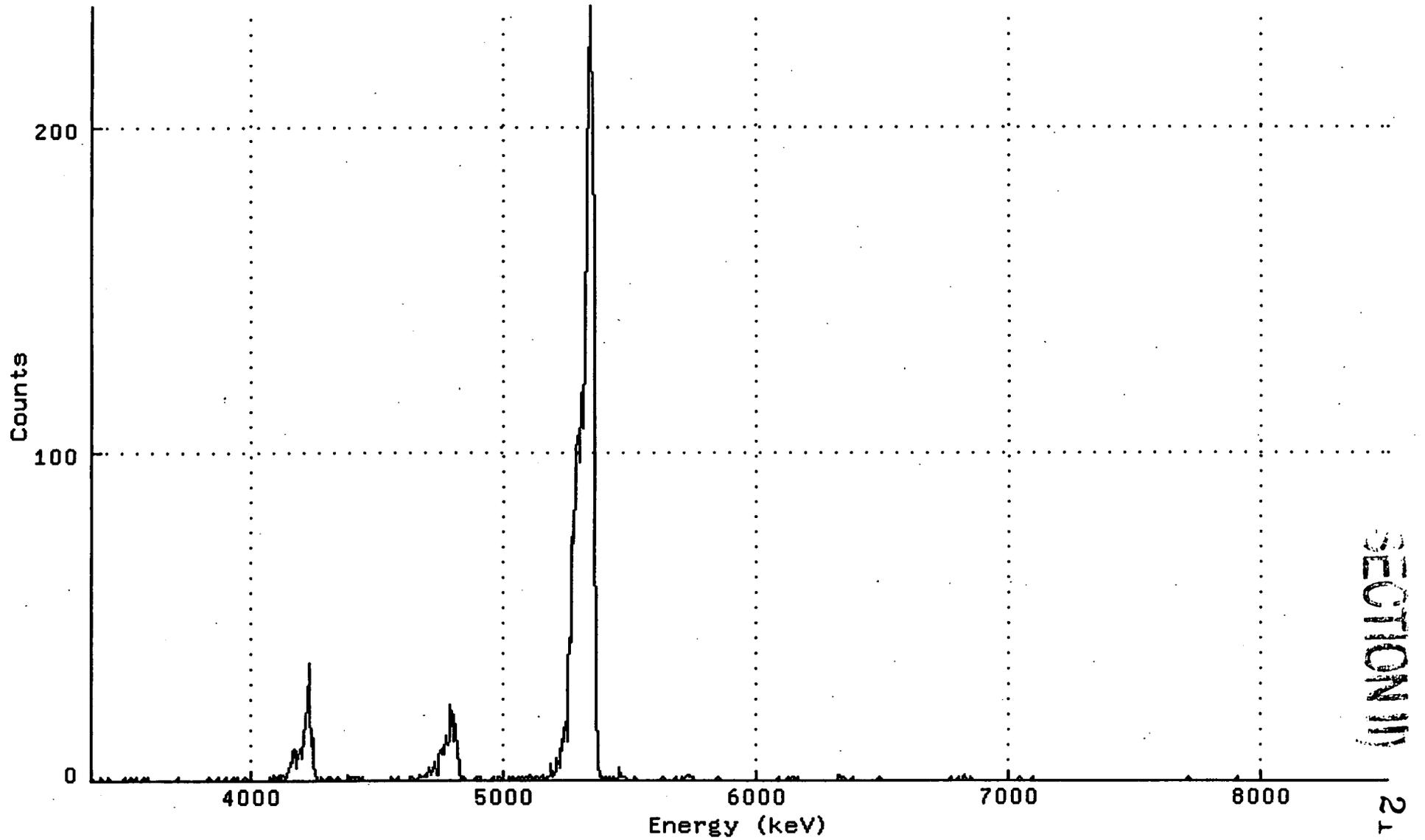
Title : 022

Sample Title:

Start Time: 8-DEC-1999 10:02: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.31390E+03

Real Time : 0 22:13:21.00 Sample ID : 263934 Energy Slope : 5.05871E+00

Live Time : 0 22:13:21.00 Sample Type: UU Energy Quad : 0.00000E+00



Spectral File: ND_AMS_ARCHIVE_S:S_99126527\$263935_UU.CNF

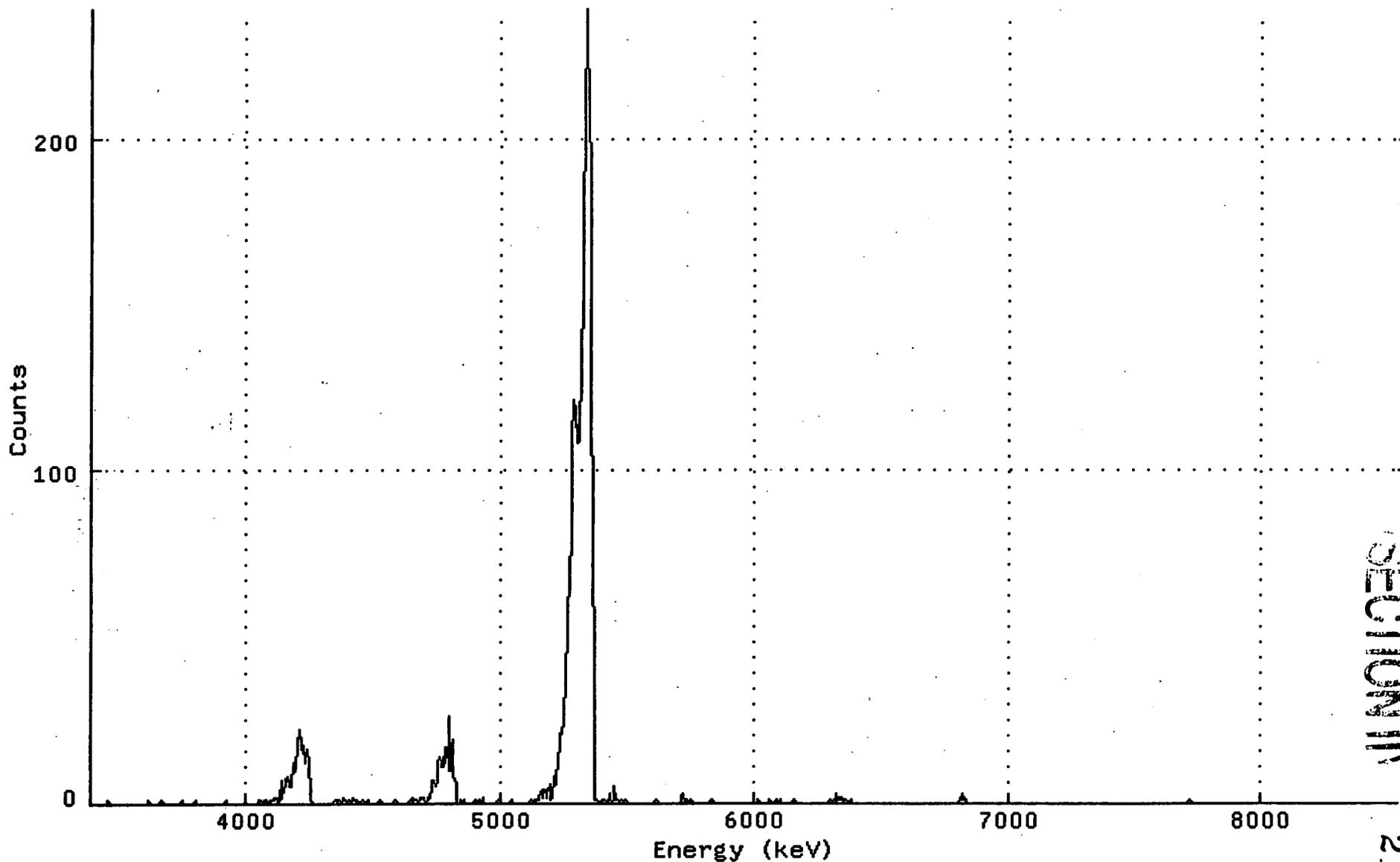
BATCH ID: 99126527 * SAMPLE ID: 263935
SAMPLE DATE: 29-NOV-1999 00:00 * ALIQUOT: 3.280E-02 SA
SAMPLE TITLE: * DETECTOR NUMBER: 023
ACQ DATE: 8-DEC-1999 10:02 * AVERAGE EFFICIENCY: 25.8%
ELAPSED LIVE TIME: 80001. * RECOVERY: 83.10%
TRACER ID: U232-178-06-3 * TRACER FWHM (kev): 42.95
LAMBDA VALUE: 100. * ROI TYPE: STANDARD
CORRECTED TRACER DPM: 10.570 * CONFIDENCE LEVEL: 4.65
SAMPLE MATRIX: MISC * LLD CONSTANT: 2.71
ENERGY CAL DATE: 3-DEC-1999 06:30 * EFF CAL DATE: 3-DEC-1999 06:30
BKG FILENAME: B_023_3DEC99 *

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/	TPU/ERROR SA 2-SIGMA	MDC dpm/	CRIT LEVEL SA
U232	5302.5	3011.40	5.60	99.8	3.223E+02	1.430E+01	1.467E+00	8.786E-01
U-234	4761.5	239.80	3.20	99.8	2.566E+01	3.592E+00	1.180E+00	7.349E-01
U-235	4385.5	15.00	2.00	80.9	1.980E+00	1.118E+00	1.226E+00	7.916E-01
U-238	4184.4	262.80	3.20	100.2	2.800E+01	3.765E+00	1.175E+00	7.317E-01

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.500 ***

Spectrum : WIZARD\$DKC200: [ALPHA.ALUSR.ARCHIVE.S]S_99126527\$263935_UU.CNF; 2
Title : 023
Sample Title:
Start Time: 8-DEC-1999 10:02: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.33394E+03
Real Time : 0 22:13:21.00 Sample ID : 263935 Energy Slope : 5.07911E+00
Live Time : 0 22:13:21.00 Sample Type: UU Energy Quad : 0.00000E+00



SECTION IV

217

 Spectral File: ND_AMS_ARCHIVE_S:S_99126527\$263936_UU.CNF

BATCH ID:	99126527	SAMPLE ID:	263936
SAMPLE DATE:	29-NOV-1999 00:00	ALIQUOT:	4.530E-02 SA
SAMPLE TITLE:		DETECTOR NUMBER:	027
ACQ DATE:	8-DEC-1999 10:03	AVERAGE EFFICIENCY:	26.7%
ELAPSED LIVE TIME:	80003.	RECOVERY:	76.79%
TRACER ID:	U232-178-06-3	TRACER FWHM (kev):	48.16
LAMBDA VALUE:	100.	ROI TYPE:	STANDARD
CORRECTED TRACER DPM:	10.570	CONFIDENCE LEVEL:	4.65
SAMPLE MATRIX:	MISC	LLD CONSTANT:	2.71
ENERGY CAL DATE:	3-DEC-1999 06:34	EFF CAL DATE:	3-DEC-1999 06:34
BKG FILENAME:	B_027_3DEC99		

 NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/	TPU/ERROR SA 2-SIGMA	MDC dpm/	CRIT LEVEL SA dpm/	S
U232	5302.5	2878.20	6.80	99.8	2.333E+02	1.053E+01	1.202E+00	7.110E-01	
U-234	4761.5	267.40	1.60	99.8	2.167E+01	2.888E+00	6.964E-01	4.580E-01	
U-235	4385.5	10.00	4.00	80.9	9.998E-01	7.915E-01	1.201E+00	7.359E-01	
U-238	4184.4	276.40	1.60	100.2	2.231E+01	2.931E+00	6.934E-01	4.560E-01	

 *** POSITIVE ***
 *** RECOUNT SAMPLE CL > 0.500 ***

Spectrum : WIZARD\$DKC200: [ALPHA.ALUSR.ARCHIVE.S]S_99126527\$263936_UU.CNF; 2

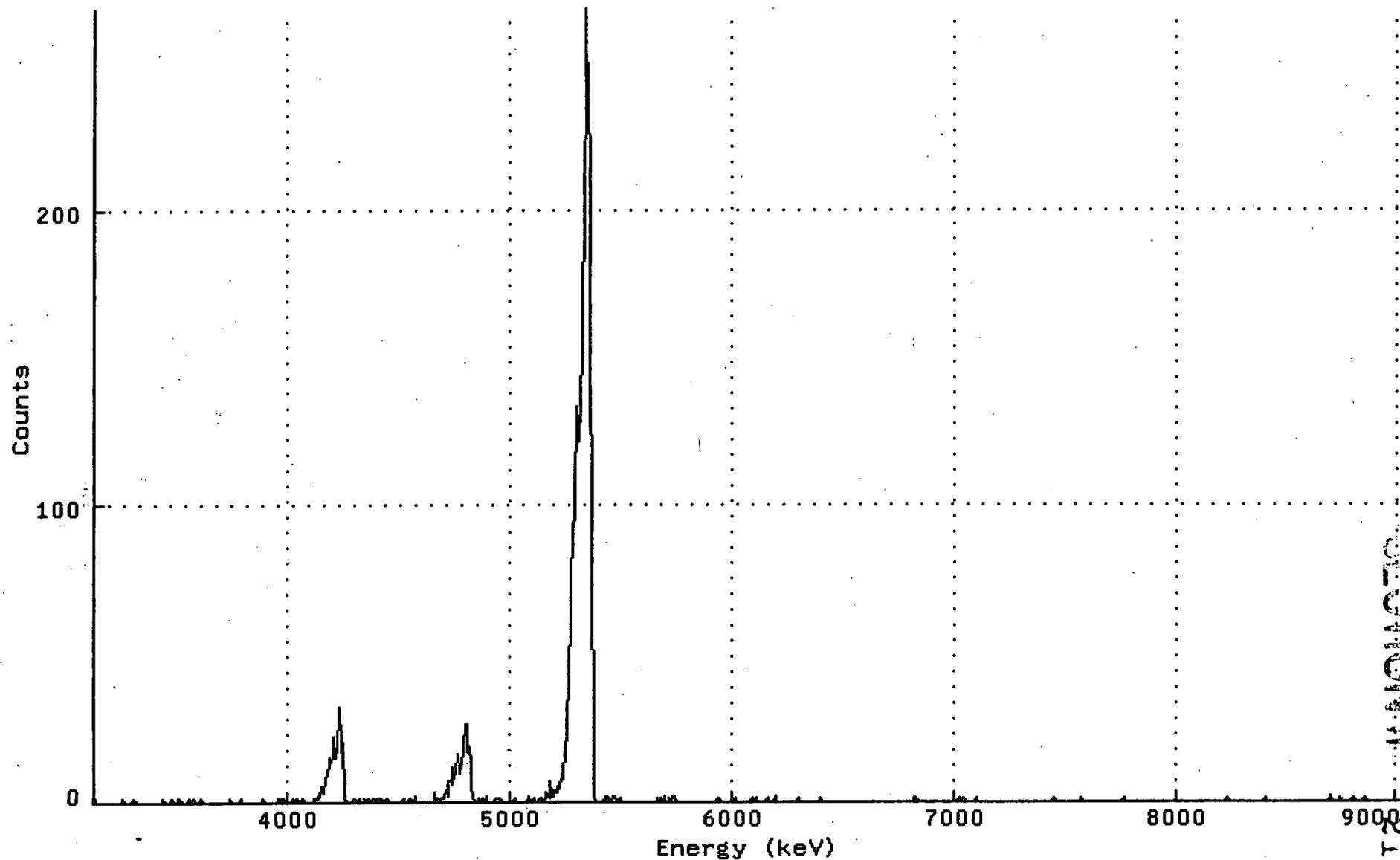
Title : 027

Sample Title:

Start Time: 8-DEC-1999 10:03: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.06580E+03

Real Time : 0 22:13:24.00 Sample ID : 263936 Energy Slope : 5.80855E+00

Live Time : 0 22:13:23.00 Sample Type: UU Energy Quad : 0.00000E+00



SECTION 11
219

SECTION II

Spectral File: ND_AMS_ARCHIVE_S:S_99126527\$263937_UU.CNF

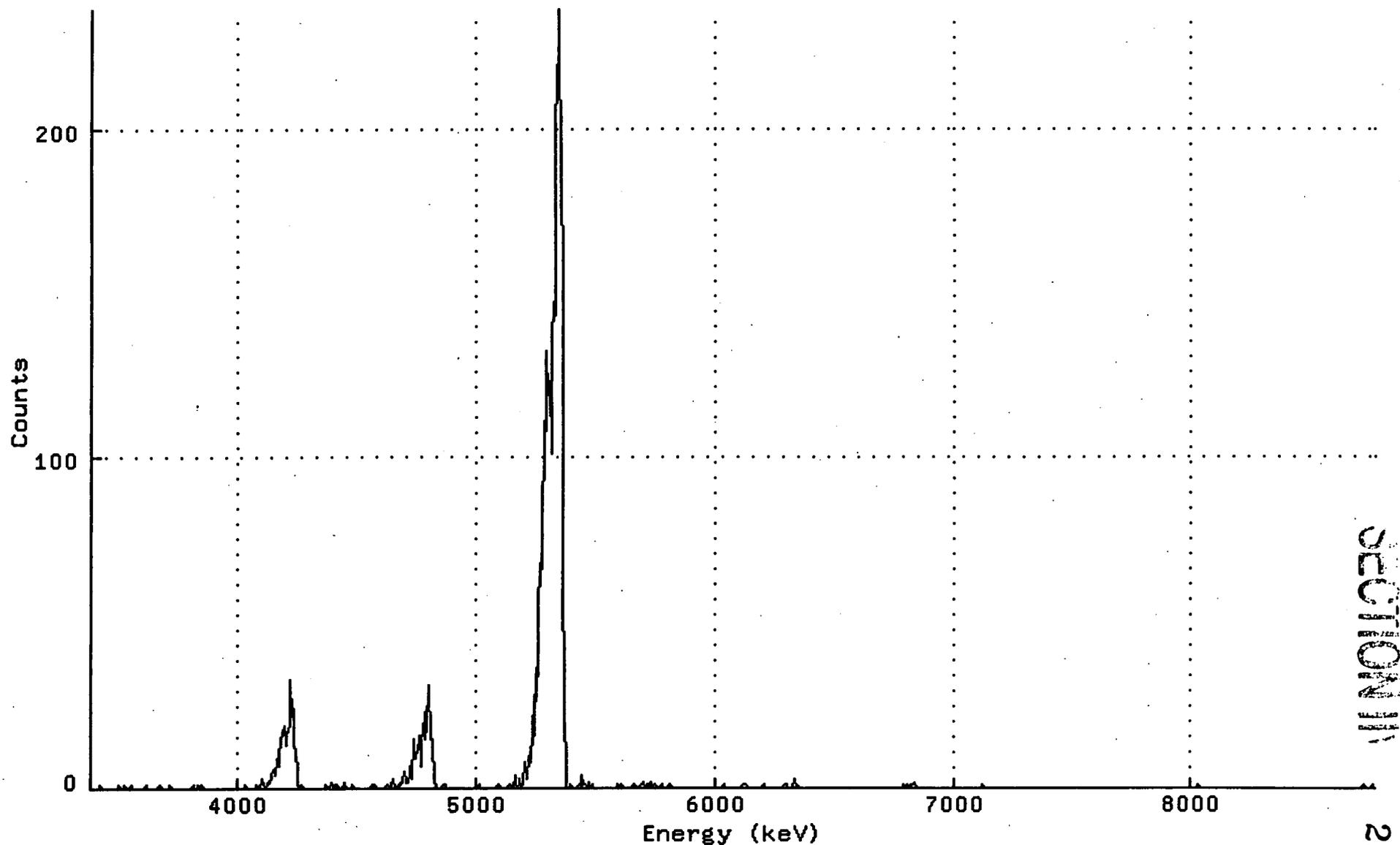
BATCH ID: 99126527 * SAMPLE ID: 263937
SAMPLE DATE: 29-NOV-1999 00:00 * ALIQUOT: 3.890E-02 SA
SAMPLE TITLE: * DETECTOR NUMBER: 028
ACQ DATE: 8-DEC-1999 10:03 • AVERAGE EFFICIENCY: 26.5%
ELAPSED LIVE TIME: 80003. • RECOVERY: 76.67%
TRACER ID: U232-178-06-3 * TRACER FWHM (kev): 69.07
LAMBDA VALUE: 100. * ROI TYPE: STANDARD
CORRECTED TRACER DPM: 10.570 * CONFIDENCE LEVEL: 4.65
SAMPLE MATRIX: MISC • LLD CONSTANT: 2.71
ENERGY CAL DATE: 3-DEC-1999 06:36 * EFF CAL DATE: 3-DEC-1999 06:36
BKG FILENAME: B_028_3DEC99 *
•

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/	TPU/ERROR SA 2-SIGMA	MDC dpm/ SA	CRIT LEVEL dpm/ S
U232	5302.5	2856.00	4.00	99.8	2.717E+02	1.228E+01	1.142E+00	7.001E-01
U-234	4761.5	286.00	4.00	99.8	2.720E+01	3.541E+00	1.142E+00	7.001E-01
U-235	4385.5	9.40	3.60	80.9	1.103E+00	8.936E-01	1.353E+00	8.356E-01
U-238	4184.4	300.00	6.00	100.2	2.841E+01	3.637E+00	1.335E+00	7.960E-01

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.500 ***

Spectrum : WIZARD\$DKC200:[ALPHA.ALUSR.ARCHIVE.S]S_99126527\$263937_UU.CNF;2
Title : 028
Sample Title:
Start Time: 8-DEC-1999 10:03: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.32818E+03
Real Time : 0 22:13:23.00 Sample ID : 263937 Energy Slope : 5.30673E+00
Live Time : 0 22:13:23.00 Sample Type: UU Energy Quad : 0.00000E+00



SECTION 11
221

893

 Spectral File: ND_AMS_ARCHIVE_S:S_99126527\$263938_UU.CNF

BATCH ID:	99126527	*	SAMPLE ID:	263938
SAMPLE DATE:	29-NOV-1999 00:00	*	ALIQUOT:	6.360E-02 SA
SAMPLE TITLE:		*	DETECTOR NUMBER:	030
ACQ DATE:	8-DEC-1999 10:03	*	AVERAGE EFFICIENCY:	25.9%
ELAPSED LIVE TIME:	80000.	*	RECOVERY:	79.49%
TRACER ID:	U232-178-06-3	*	TRACER FWHM (kev):	76.94
LAMBDA VALUE:	100.	*	ROI TYPE:	STANDARD
CORRECTED TRACER DPM:	10.570	*	CONFIDENCE LEVEL:	4.65
SAMPLE MATRIX:	MISC	*	LLD CONSTANT:	2.71
ENERGY CAL DATE:	3-DEC-1999 06:37	*	EFF CAL DATE:	3-DEC-1999 06:37
BKG FILENAME:	B_030_3DEC99	*		

 NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/SA	TPU/ERROR 2-SIGMA	MDC dpm/SA	CRIT LEVEL dpm/SA
U232	5302.5	2889.40	3.60	99.8	1.662E+02	7.498E+00	6.632E-01	4.095E-01
U-234	4761.5	237.20	2.80	99.8	1.364E+01	1.921E+00	6.033E-01	3.796E-01
U-235	4385.5	18.00	8.00	80.9	1.277E+00	7.695E-01	1.125E+00	6.587E-01
U-238	4184.4	254.20	4.80	100.2	1.455E+01	1.998E+00	7.385E-01	4.468E-01

 *** POSITIVE ***
 *** RECOUNT SAMPLE CL > 0.500 ***

Spectrum : WIZARD\$DKC200: [ALPHA.ALUSR.ARCHIVE.S]S_99126527\$263938_UU.CNF; 2

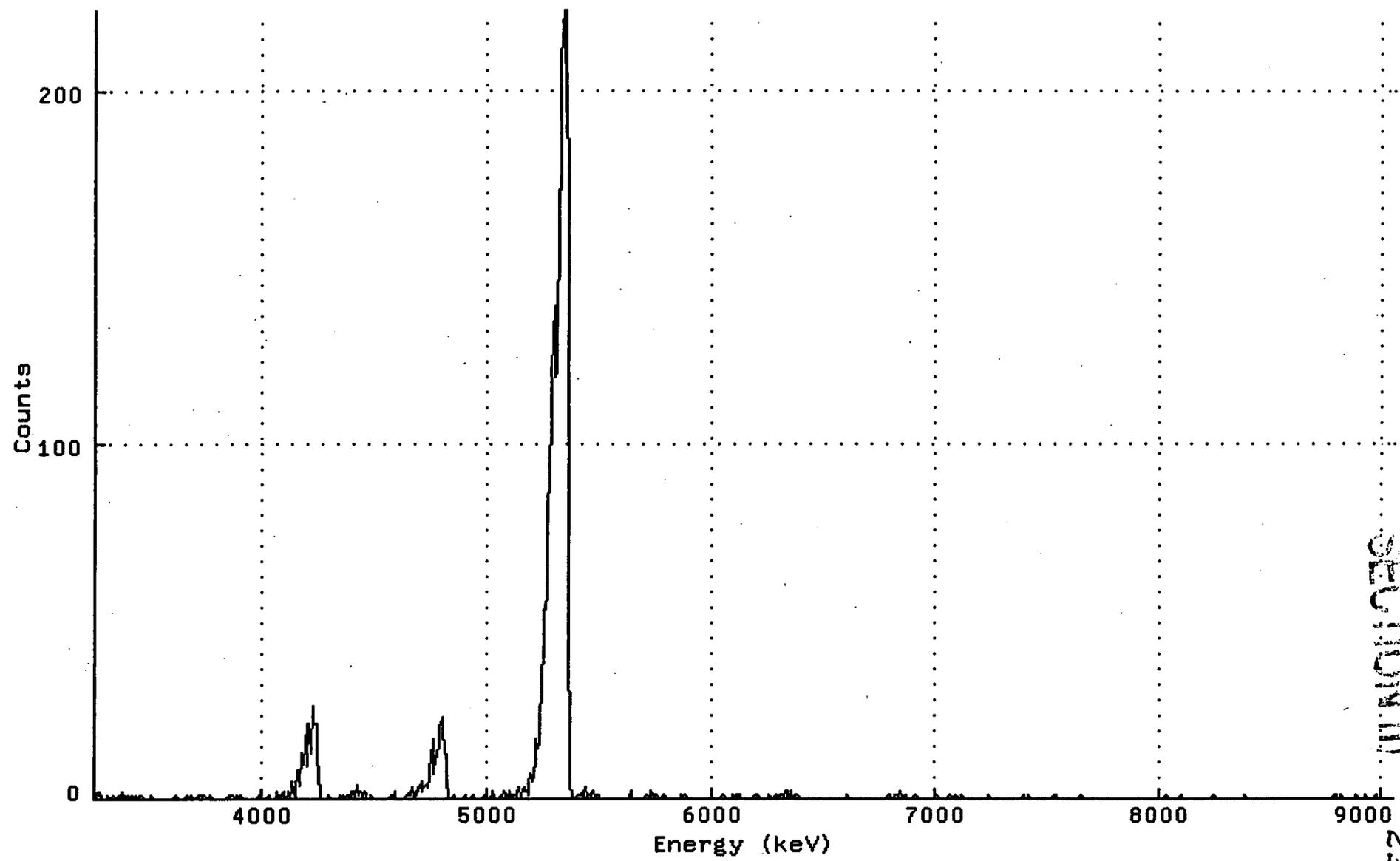
Title : 030

Sample Title:

Start Time: 8-DEC-1999 10:03: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.19240E+03

Real Time : 0 22:13:20.00 Sample ID : 263938 Energy Slope : 5.71731E+00

Live Time : 0 22:13:20.00 Sample Type: UU Energy Quad : 0.00000E+00



SECTION III

223

395

Spectral File: ND_AMS_ARCHIVE_S:S_99126527\$263939_UU.CNF

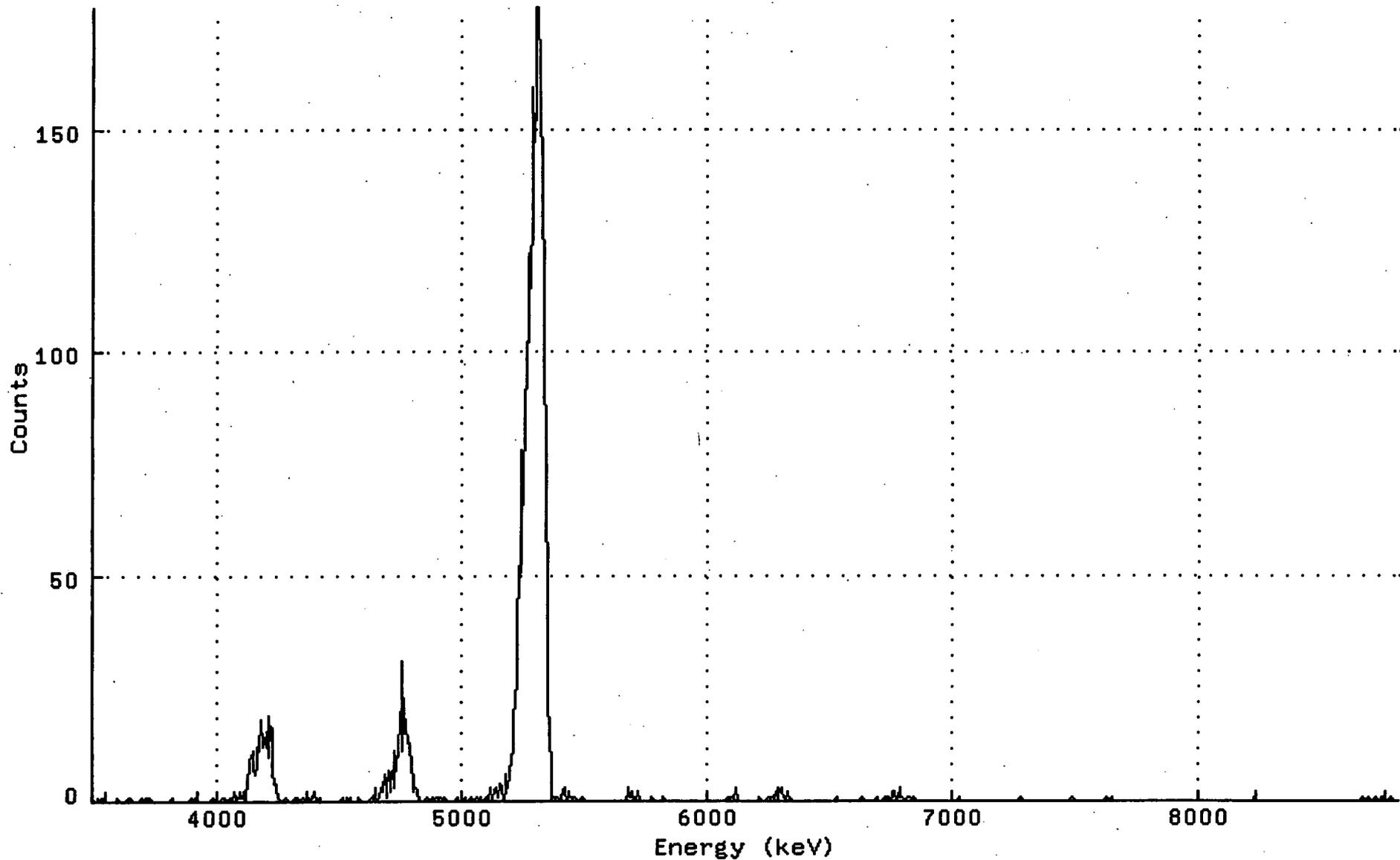
```
BATCH ID:          99126527      *      SAMPLE ID:          263939
SAMPLE DATE:       29-NOV-1999 00:00 *      ALIQUOT:           4.610E-02  SA
SAMPLE TITLE:      *      DETECTOR NUMBER:       031
ACQ DATE:          8-DEC-1999 10:03 *      AVERAGE EFFICIENCY:  26.1%
ELAPSED LIVE TIME: 80002.        *      RECOVERY:             76.25%
TRACER ID:         U232-178-06-3 *      TRACER FWHM (kev):   78.88
LAMBDA VALUE:      100.          *      ROI TYPE:            STANDARD
CORRECTED TRACER DPM: 10.570    *      CONFIDENCE LEVEL:   4.65
SAMPLE MATRIX:     MISC          *      LLD CONSTANT:       2.71
ENERGY CAL DATE:   3-DEC-1999 06:39 *      EFF CAL DATE:       3-DEC-1999 06:39
BKG FILENAME:      B_031_3DEC99  *
*****
```

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/	TPU/ERROR SA 2-SIGMA	MDC dpm/ SA	CRIT LEVEL dpm/ SA
U232	5302.5	2794.40	9.60	99.8	2.293E+02	1.045E+01	1.404E+00	8.133E-01
U-234	4761.5	254.40	9.60	99.8	2.087E+01	2.897E+00	1.404E+00	8.133E-01
U-235	4385.5	4.00	12.00	80.9	4.046E-01	9.233E-01	1.904E+00	1.089E+00
U-238	4184.4	245.40	21.60	100.2	2.004E+01	2.906E+00	1.987E+00	1.104E+00

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.500 ***

Spectrum : WIZARD\$DKC200: [ALPHA.ALUSR.ARCHIVE.S]S_99126527\$263939_UU.CNF; 2
Title : 031
Sample Title:
Start Time: 8-DEC-1999 10:03: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.44103E+03
Real Time : 0 22:13:22.00 Sample ID : 263939 Energy Slope : 5.24816E+00
Live Time : 0 22:13:22.00 Sample Type: UU Energy Quad : 0.00000E+00



SECTION 1
225

 Spectral File: ND_AMS_ARCHIVE_S:S_99126527\$263940_UU.CNF

BATCH ID:	99126527	SAMPLE ID:	263940
SAMPLE DATE:	29-NOV-1999 00:00	ALIQUOT:	6.670E-02 SA
SAMPLE TITLE:		DETECTOR NUMBER:	032
ACQ DATE:	8-DEC-1999 10:03	AVERAGE EFFICIENCY:	25.4%
ELAPSED LIVE TIME:	80001.	RECOVERY:	77.68%
TRACER ID:	U232-178-06-3	TRACER FWHM (kev):	79.33
LAMBDA VALUE:	100.	ROI TYPE:	STANDARD
CORRECTED TRACER DPM:	10.570	CONFIDENCE LEVEL:	4.65
SAMPLE MATRIX:	MISC	LLD CONSTANT:	2.71
ENERGY CAL DATE:	3-DEC-1999 06:41	EFF CAL DATE:	3-DEC-1999 06:41
BKG FILENAME:	B_032_3DEC99		

 NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/	TPU/ERROR SA 2-SIGMA	MDC dpm/ SA	CRIT LEVEL dpm/ SA
U232	5302.5	2777.80	5.20	99.8	1.585E+02	7.240E+00	7.593E-01	4.570E-01
U-234	4761.5	311.60	4.40	99.8	1.777E+01	2.235E+00	7.109E-01	4.327E-01
U-235	4385.5	13.80	5.20	80.9	9.710E-01	6.481E-01	9.367E-01	5.637E-01
U-238	4184.4	277.20	2.80	100.2	1.574E+01	2.074E+00	5.958E-01	3.748E-01

 *** POSITIVE ***
 *** RECOUNT SAMPLE CL > 0.500 ***

Spectrum : WIZARD\$DKC200: [ALPHA.ALUSR.ARCHIVE.S]S_99126527\$263940_UU.CNF; 2

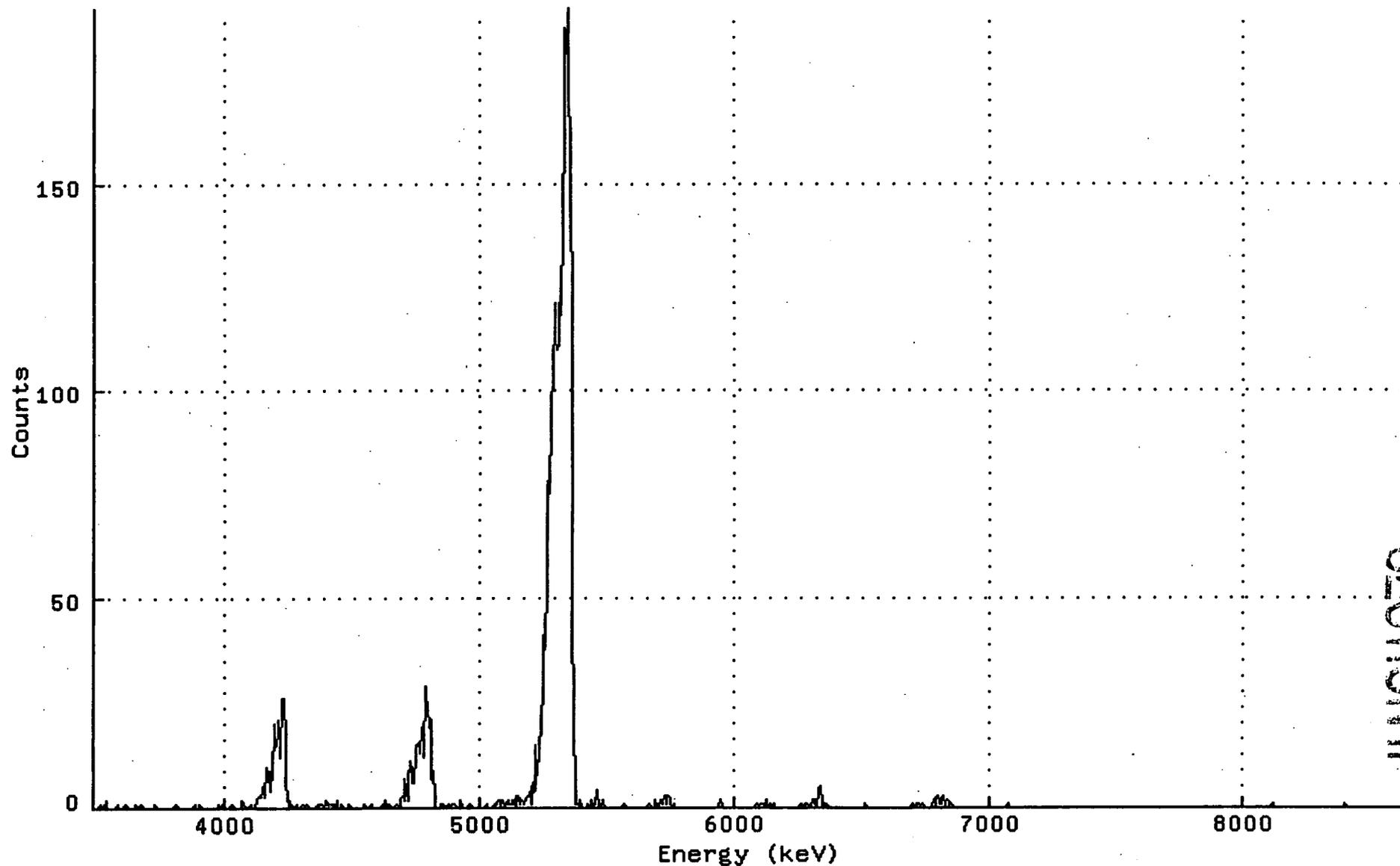
Title : 032

Sample Title:

Start Time: 8-DEC-1999 10:03: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.43333E+03

Real Time : 0 22:13:21.00 Sample ID : 263940 Energy Slope : 5.07570E+00

Live Time : 0 22:13:21.00 Sample Type: UU Energy Quad : 0.00000E+00



SECTION III

227

399

 Spectral File: ND_AMS_ARCHIVE_S:S_99126527\$263941_UU.CNF

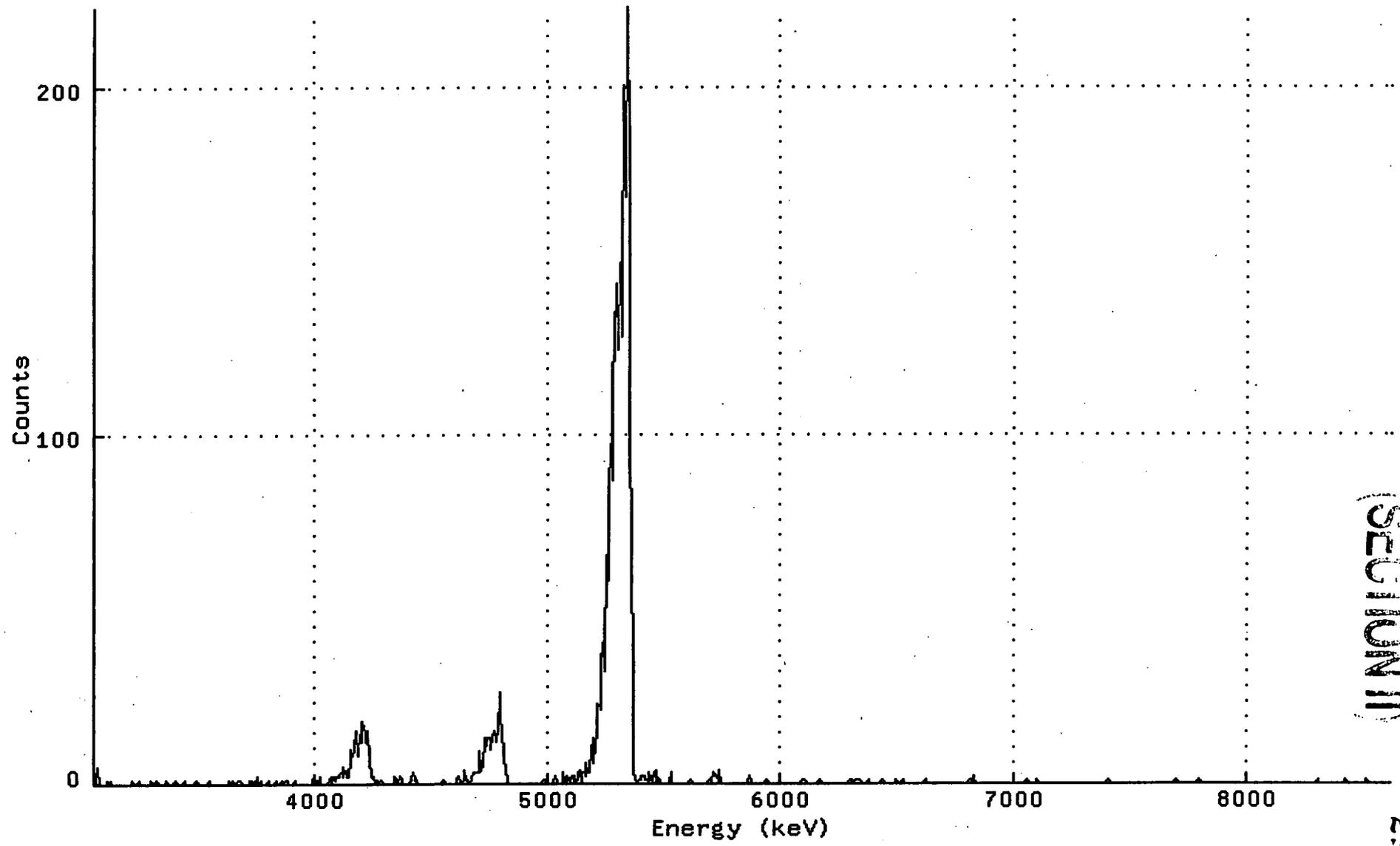
BATCH ID:	99126527	SAMPLE ID:	263941
SAMPLE DATE:	29-NOV-1999 00:00	ALIQUOT:	3.760E-02 SA
SAMPLE TITLE:		DETECTOR NUMBER:	005
ACQ DATE:	9-DEC-1999 09:55	AVERAGE EFFICIENCY:	24.8%
ELAPSED LIVE TIME:	80002.	RECOVERY:	82.32%
TRACER ID:	U232-178-06-3	TRACER FWHM (kev):	69.16
LAMBDA VALUE:	100.	ROI TYPE:	STANDARD
CORRECTED TRACER DPM:	10.570	CONFIDENCE LEVEL:	4.65
SAMPLE MATRIX:	MISC	LLD CONSTANT:	2.71
ENERGY CAL DATE:	3-DEC-1999 06:17	EFF CAL DATE:	3-DEC-1999 06:17
BKG FILENAME:	B_005_3DEC99		

 NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/SA	TPU/ERROR 2-SIGMA	MDC dpm/SA	CRIT LEVEL dpm/SA
U232	5302.5	2868.00	6.00	99.8	2.811E+02	1.270E+01	1.382E+00	8.236E-01
U-234	4761.5	264.00	4.00	99.8	2.587E+01	3.486E+00	1.177E+00	7.212E-01
U-235	4385.5	13.40	3.60	80.9	1.620E+00	1.042E+00	1.394E+00	8.609E-01
U-238	4184.4	227.80	3.20	100.2	2.223E+01	3.189E+00	1.076E+00	6.702E-01

 *** POSITIVE ***
 *** RECOUNT SAMPLE CL > 0.500 ***

Spectrum : WIZARD\$DKC200.LALPHA.ALUSK.ARCHIVE.SJS_99126827\$263941_00.CNF,2
Title : 005
Sample Title:
Start Time: 9-DEC-1999 09:55: Sample Time: 29-NOV-1999 00:00 Energy Offset: 2.99915E+03
Real Time : 0 22:13:22.00 Sample ID : 263941 Energy Slope : 5.48330E+00
Live Time : 0 22:13:22.00 Sample Type: UU Energy Quad : 0.00000E+00



SECTION 11

229

401

Spectral File: ND_AMS_ARCHIVE_S:S_99126527\$263942_UU.CNF

BATCH ID: 99126527 *
SAMPLE DATE: 29-NOV-1999 00:00 *
SAMPLE TITLE: *
ACQ DATE: 9-DEC-1999 09:56 *
ELAPSED LIVE TIME: 80000. *
TRACER ID: U232-178-06-3 *
LAMBDA VALUE: 100. *
CORRECTED TRACER DPM: 10.570 *
SAMPLE MATRIX: MISC *
ENERGY CAL DATE: 3-DEC-1999 06:21 *
BKG FILENAME: B_014_3DEC99 *

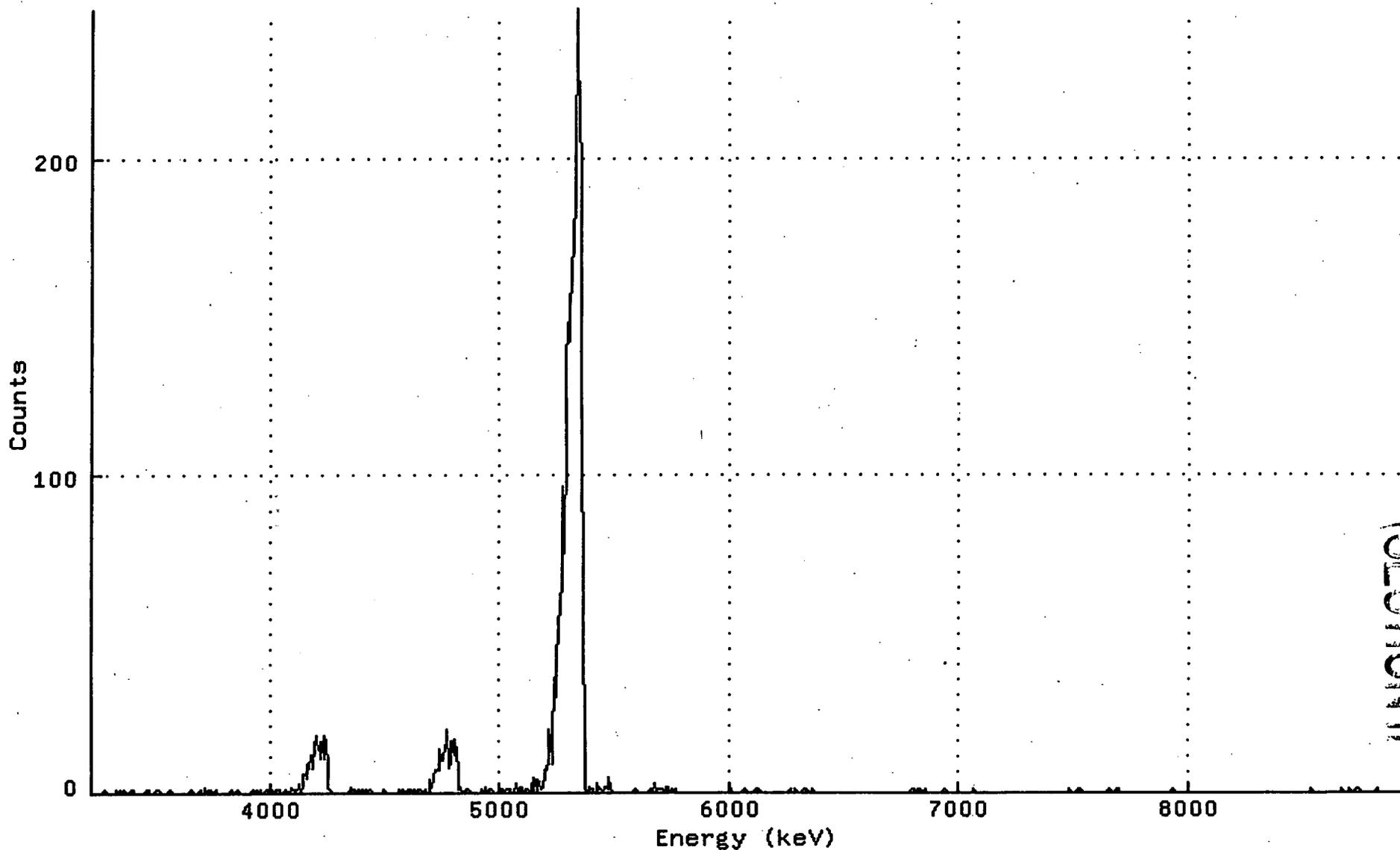
SAMPLE ID: 263942 *
ALIQUOT: 3.730E-02 SA *
DETECTOR NUMBER: 014 *
AVERAGE EFFICIENCY: 26.1% *
RECOVERY: 81.50% *
TRACER FWHM (kev): 69.69 *
ROI TYPE: STANDARD *
CONFIDENCE LEVEL: 4.65 *
LLD CONSTANT: 2.71 *
EFF CAL DATE: 3-DEC-1999 06:21 *

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/SA	TPU/ERROR 2-SIGMA	MDC dpm/SA	CRIT LEVEL dpm/SA
U232	5302.5	2995.40	19.60	99.8	2.834E+02	1.262E+01	2.203E+00	1.230E+00
U-234	4761.5	226.00	10.00	99.8	2.137E+01	3.128E+00	1.647E+00	9.517E-01
U-235	4385.5	5.40	7.60	80.9	6.300E-01	9.351E-01	1.812E+00	1.064E+00
U-238	4184.4	237.00	8.00	100.2	2.232E+01	3.180E+00	1.494E+00	8.745E-01

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.500 ***

Spectrum : WIZARD\$DKC200: [ALPHA.ALUSR.ARCHIVE.S]S_99126527\$263942_UU.CNF; 2
Title : 014
Sample Title:
Start Time: 9-DEC-1999 09:56: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.16850E+03
Real Time : 0 22:13:20.00 Sample ID : 263942 Energy Slope : 5.62876E+00
Live Time : 0 22:13:20.00 Sample Type: UU Energy Quad : 0.00000E+00



SECTION 11

231

463

Spectral File: ND_AMS_ARCHIVE_S:S_99126527\$263943_UU.CNF

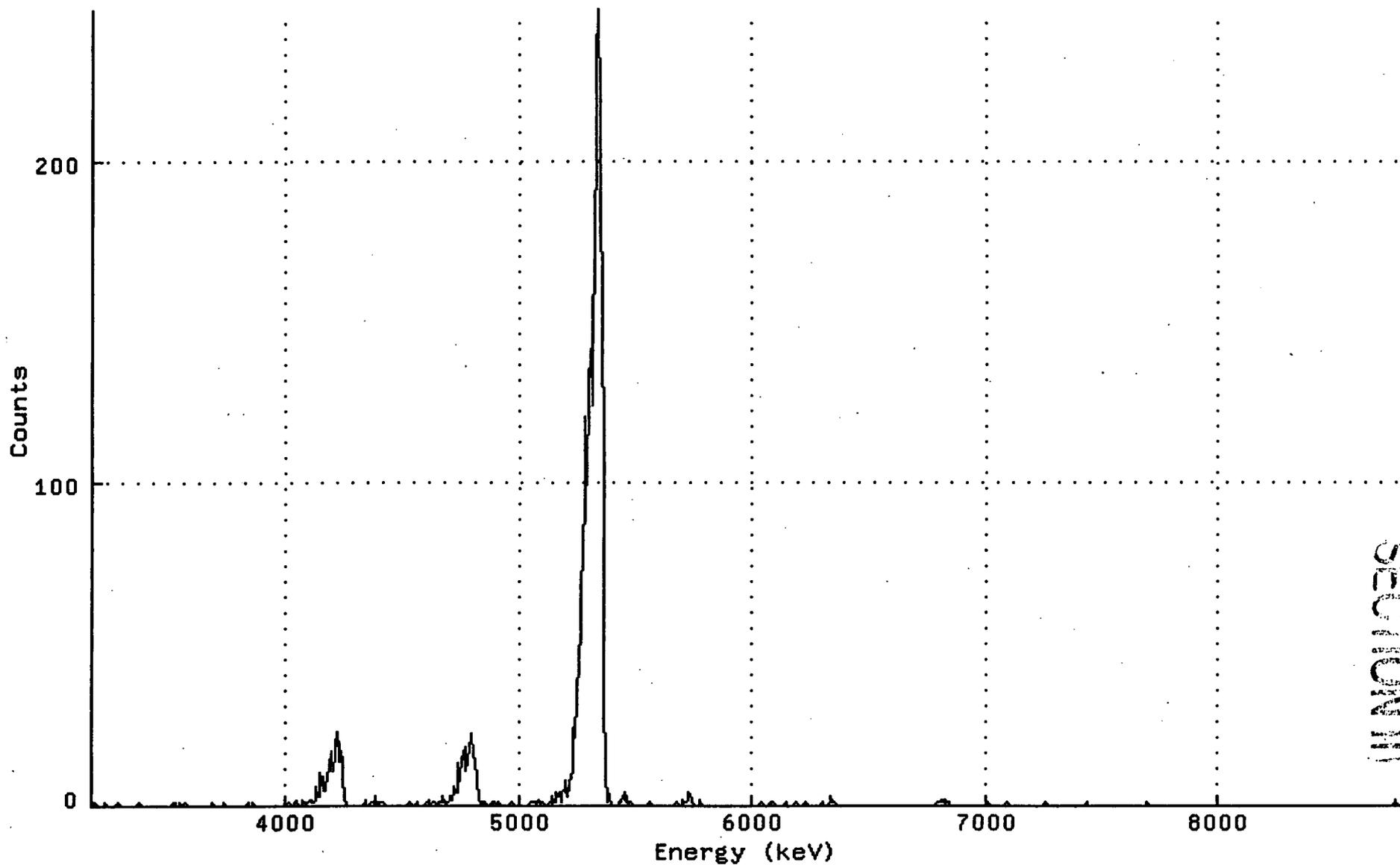
BATCH ID: 99126527 * SAMPLE ID: 263943
SAMPLE DATE: 29-NOV-1999 00:00 * ALIQUOT: 5.230E-02 SA
SAMPLE TITLE: * DETECTOR NUMBER: 015
ACQ DATE: 9-DEC-1999 09:56 * AVERAGE EFFICIENCY: 26.1%
ELAPSED LIVE TIME: 80004. * RECOVERY: 80.35%
TRACER ID: U232-178-06-3 * TRACER FWHM (kev): 65.35
LAMBDA VALUE: 100. * ROI TYPE: STANDARD
CORRECTED TRACER DPM: 10.570 * CONFIDENCE LEVEL: 4.65
SAMPLE MATRIX: MISC * LLD CONSTANT: 2.71
ENERGY CAL DATE: 3-DEC-1999 06:23 * EFF CAL DATE: 3-DEC-1999 06:23
BKG FILENAME: B_015_3DEC99 *

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/SA	TPU/ERROR 2-SIGMA	MDC dpm/SA	CRIT LEVEL dpm/SA
U232	5302.5	2950.40	7.60	99.8	2.021E+02	9.049E+00	1.063E+00	6.245E-01
U-234	4761.5	263.20	2.80	99.8	1.802E+01	2.423E+00	7.184E-01	4.520E-01
U-235	4385.5	12.40	1.60	80.9	1.048E+00	6.487E-01	7.258E-01	4.774E-01
U-238	4184.4	264.80	1.20	100.2	1.806E+01	2.412E+00	5.321E-01	3.585E-01

*** POSITIVE ***

Spectrum : WIZARD\$DKC200: [ALPHA.ALUSR.ARCHIVE.S]S_99126527\$263943_UU.CNF; 2
Title : 015
Sample Title:
Start Time: 9-DEC-1999 09:56: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.11170E+03
Real Time : 0 22:13:24.00 Sample ID : 263943 Energy Slope : 5.53627E+00
Live Time : 0 22:13:24.00 Sample Type: UU Energy Quad : 0.00000E+00



SECTION 11

233

405

 Spectral File: ND_AMS_ARCHIVE_S:S_99126527\$263944_UU.CNF

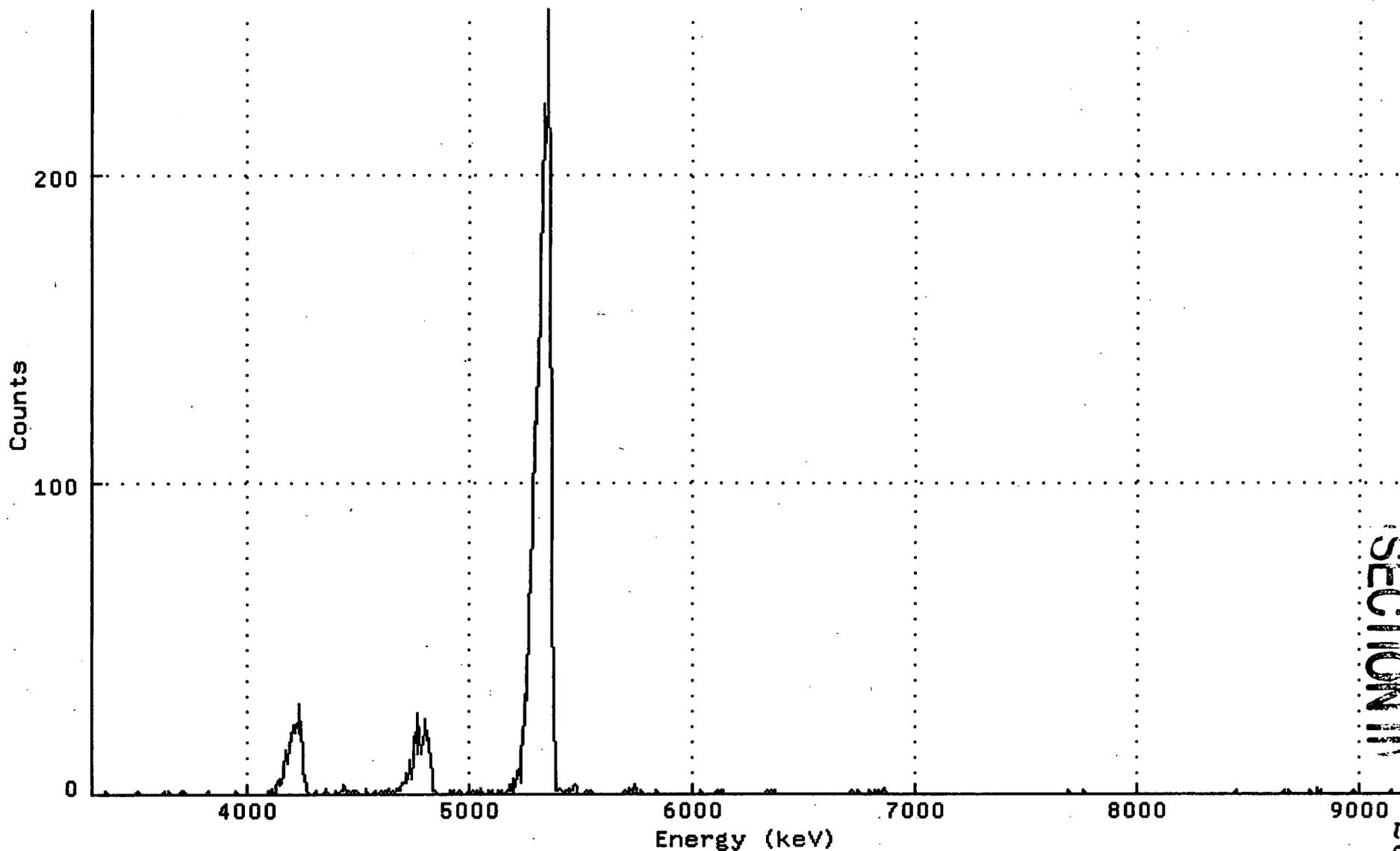
BATCH ID:	99126527	SAMPLE ID:	263944
SAMPLE DATE:	29-NOV-1999 00:00	ALIQUOT:	3.240E-02 SA
SAMPLE TITLE:		DETECTOR NUMBER:	017
ACQ DATE:	9-DEC-1999 09:56	AVERAGE EFFICIENCY:	26.1%
ELAPSED LIVE TIME:	80001.	RECOVERY:	82.47%
TRACER ID:	U232-178-06-3	TRACER FWHM (kev):	59.37
LAMBDA VALUE:	100.	ROI TYPE:	STANDARD
CORRECTED TRACER DPM:	10.570	CONFIDENCE LEVEL:	4.65
SAMPLE MATRIX:	MISC	LLD CONSTANT:	2.71
ENERGY CAL DATE:	3-DEC-1999 06:24	EFF CAL DATE:	3-DEC-1999 06:24
BKG FILENAME:	B_017_3DEC99		

 NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/SA	TPU/ERROR 2-SIGMA	MDC dpm/SA	CRIT LEVEL dpm/SA
U232	5302.5	3031.60	6.40	99.8	3.262E+02	1.448E+01	1.557E+00	9.243E-01
U-234	4761.5	318.60	4.40	99.8	3.428E+01	4.256E+00	1.341E+00	8.162E-01
U-235	4385.5	13.00	6.00	80.9	1.725E+00	1.231E+00	1.871E+00	1.115E+00
U-238	4184.4	304.40	1.60	100.2	3.261E+01	4.106E+00	9.204E-01	6.053E-01

 *** POSITIVE ***
 *** RECOUNT SAMPLE CL > 0.500 ***

Spectrum : WIZARD\$DKC200: [ALPHA.ALUSR.ARCHIVE.S]S_99126527\$263944_UU.CNF; 2
Title : 017
Sample Title:
Start Time: 9-DEC-1999 09:56: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.24209E+03
Real Time : 0 22:13:21.00 Sample ID : 263944 Energy Slope : 5.79799E+00
Live Time : 0 22:13:21.00 Sample Type: UU Energy Quad : 0.00000E+00



SECTION 11

235

407

SECTION III

Spectral File: ND_AMS_ARCHIVE_S:S_99126527\$263931D_UU.CNF

BATCH ID: 99126527 * SAMPLE ID: 263931D *
SAMPLE DATE: 29-NOV-1999 00:00 * ALIQUOT: 6.310E-02 SA *
SAMPLE TITLE: * DETECTOR NUMBER: 018 *
ACQ DATE: 9-DEC-1999 09:56 * AVERAGE EFFICIENCY: 26.1% *
ELAPSED LIVE TIME: 80001. * RECOVERY: 80.45% *
TRACER ID: U232-178-06-3 * TRACER FWHM (kev): 71.79 *
LAMBDA VALUE: 100. * ROI TYPE: STANDARD *
CORRECTED TRACER DPM: 10.570 * CONFIDENCE LEVEL: 4.65 *
SAMPLE MATRIX: MISC * LLD CONSTANT: 2.71 *
ENERGY CAL DATE: 3-DEC-1999 06:26 * EFF CAL DATE: 3-DEC-1999 06:26 *
BKG FILENAME: B_018_3DEC99 *

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY dpm/	TPU/ERROR SA 2-SIGMA	MDC dpm/	CRIT LEVEL SA dpm/	LEVEL S
U232	5302.5	2954.40	3.60	99.8	1.675E+02	7.479E+00	6.537E-01	4.037E-01	
U-234	4761.5	291.80	5.20	99.8	1.654E+01	2.136E+00	7.547E-01	4.541E-01	
U-235	4385.5	12.80	1.20	80.9	8.951E-01	5.341E-01	5.457E-01	3.676E-01	
U-238	4184.4	288.80	1.20	100.2	1.630E+01	2.098E+00	4.404E-01	2.967E-01	

*** POSITIVE ***

Spectrum : WIZARD\$DKC200: [ALPHA.ALUSR.ARCHIVE.S]S_99126527\$263931D_UU.CNF; 2

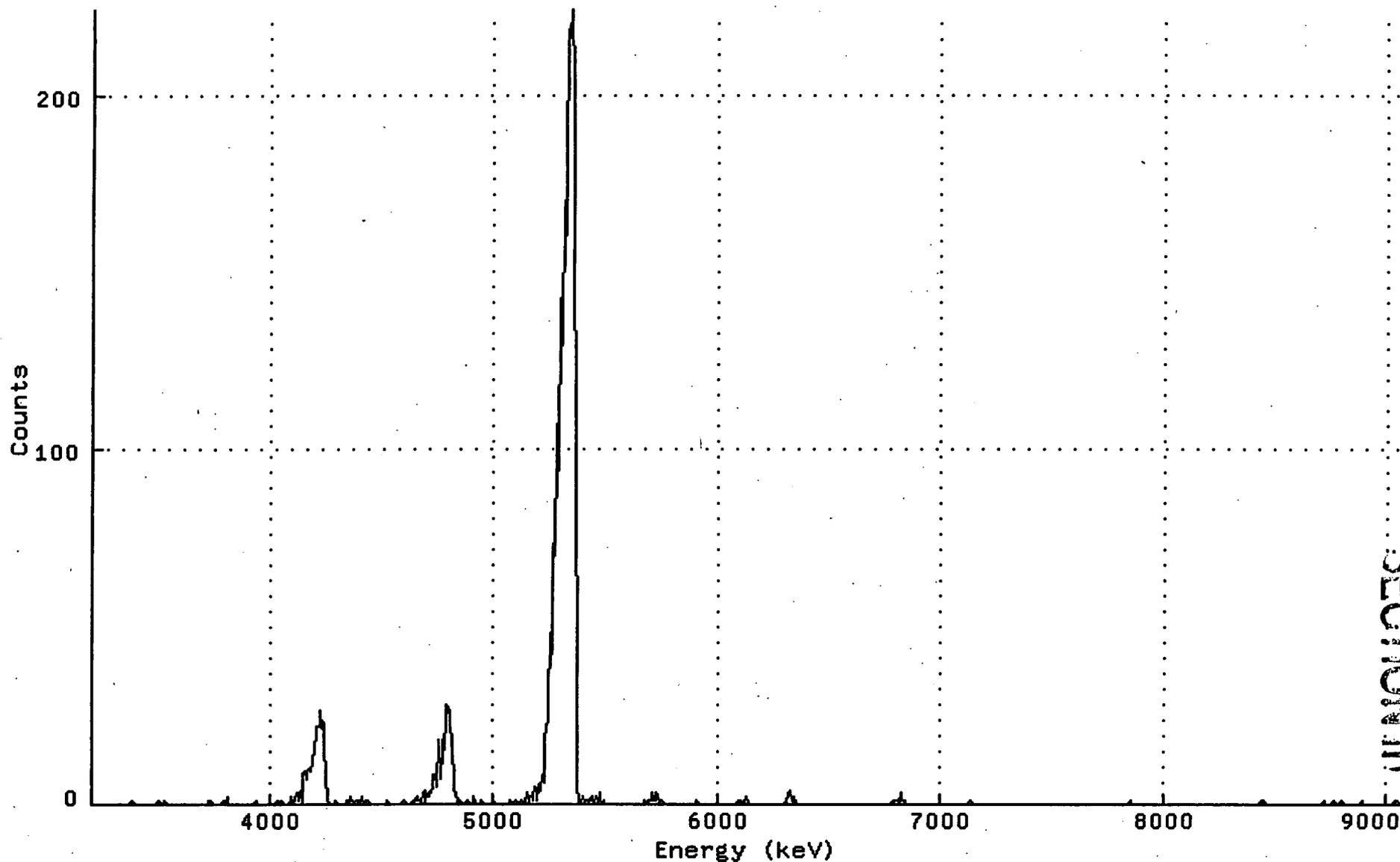
Title : 018

Sample Title:

Start Time: 9-DEC-1999 09:56: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.14472E+03

Real Time : 0 22:13:21.00 Sample ID : 263931D Energy Slope : 5.77493E+00

Live Time : 0 22:13:21.00 Sample Type: UU Energy Quad : 0.00000E+00



SECTION III

237

409

Spectral File: ND_AMS_ARCHIVE_C:C_99126527\$LCSWR1_UU.CNF

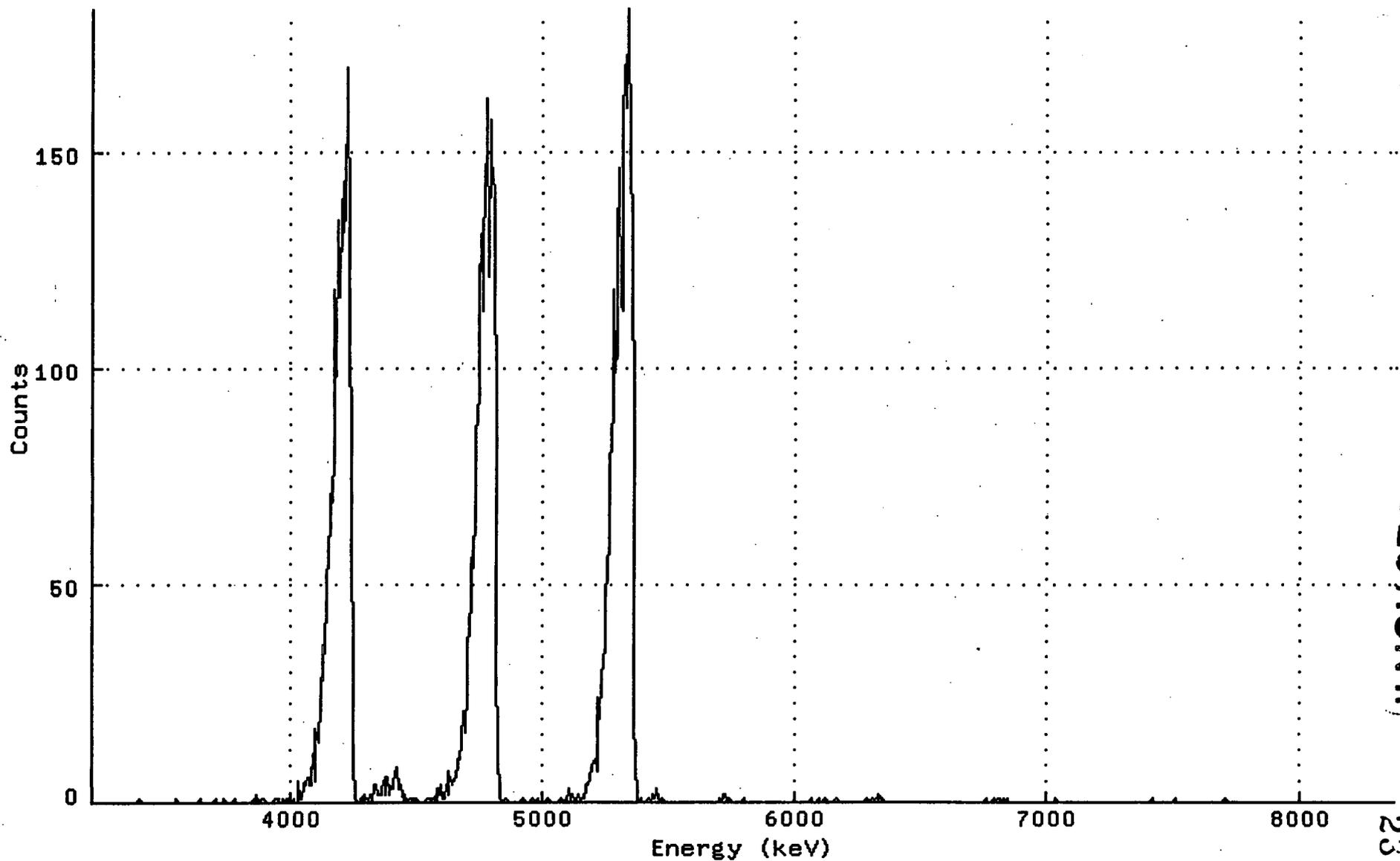
BATCH ID: 99126527 * SAMPLE ID: LCSWR1
SAMPLE DATE: 29-NOV-1999 00:00 * ALIQUOT: 2.500E-01 L
SAMPLE TITLE: * DETECTOR NUMBER: 021
ACQ DATE: 9-DEC-1999 09:57 * AVERAGE EFFICIENCY: 26.4%
ELAPSED LIVE TIME: 80001. * RECOVERY: 76.74%
TRACER ID: U232-178-06-3 * TRACER FWHM (kev): 79.63
LAMBDA VALUE: 100. * ROI TYPE: MANUAL
CORRECTED TRACER DPM: 10.570 * CONFIDENCE LEVEL: 4.65
SAMPLE MATRIX: MISC * LLD CONSTANT: 2.71
ENERGY CAL DATE: 3-DEC-1999 06:27 * EFF CAL DATE: 3-DEC-1999 06:27
BKG FILENAME: B_021_3DEC99 *

NUCLIDE ACTIVITY SUMMARY

NUCLIDE	ENERGY	NET AREA	BKG	%ABN	ACTIVITY pCi/	TPU/ERROR L 2-SIGMA	MDC pCi/	CRIT LEVEL L pCi/
U232	5302.5	2848.00	4.00	99.8	1.905E+01	8.608E-01	8.029E-02	4.920E-02
U-234	4761.5	2508.40	3.60	99.8	1.677E+01	1.097E+00	7.710E-02	4.761E-02
U-235	4385.5	101.80	1.20	80.9	8.396E-01	1.733E-01	6.436E-02	4.335E-02
U-238	4184.4	2475.20	0.80	100.2	1.648E+01	1.080E+00	4.572E-02	3.188E-02

*** POSITIVE ***

Spectrum : WIZARD\$DKC200: [ALPHA.ALUSR.ARCHIVE.C]C_99126527\$LCSWR1_UU.CNF; 2
Title : 021
Sample Title:
Start Time: 9-DEC-1999 09:57: Sample Time: 29-NOV-1999 00:00 Energy Offset: 3.16443E+03
Real Time : 0 22:13:21.00 Sample ID : LCSWR1 Energy Slope : 5.08660E+00
Live Time : 0 22:13:21.00 Sample Type: UU Energy Quad : 0.00000E+00



SECTION III
239

411



7

SECTION III

RECEIVING DOCUMENTATION INDEX

Requisition No. 16848

<u>RECEIVING DOCUMENTATION:</u>	FROM	TO
·Sample Log-in Sheet	1	2
·Request for Analytical Services	3	4
·Chain of Sample Custody	5	9
·Sample Preparation Worksheet	10	
·Release Evaluation Form	11	12
·Lab Sample Tracking Record	13	14

Grand Junction Office Analytical Laboratory

Sample Log-in Sheet

SECTION III

1

Requisition: 16848

Received by (Print Name): L.M. DAVIS

Log-In Date: 11-29, 30, 1999

Received by (Signature): J.M. Davis

Requestor: JEFF LIVELY

Project Number: 342303001

1. Custody Seal(s):

7. Sample Tags: Present / Absent

Shipping Container: Absent / Intact / Broken

8. Sample Labels on

Sample Container: Absent / Intact / Broken

Chain of Cust: Listed / Not Listed

2. Custody Seal No(s): NA

9. Does the Information on
Custody Records,

3. Chain of Custody Records: Present / Absent

Traffic Reports,

4. Traffic Rpt, Pack List, Analytical Req. / Present / Absent

Sample Labels Agree?: Yes / No

5. Freight Bill: Airbill / Sticker
Present / Absent

10. Shipping Cont. Temp.: NA
and Condition: Good

6. Freight Bill No(s): HAND DELIVERED

11. Sample pH: Acceptable / Not Acceptable
Not Applicable

Analyses Requested and Date Due

Test	Date Due	Test	Date Due	Test	Date Due	Test	Date Due
AM241	12/13/99	M1	12/13/99	PUI50	12/13/99	SWIPE	12/13/99
UI50	12/13/99						

Page 1 of 2

Sample	Ticket	Customer Id	Sample Type	Date Sampled	Condition	Date Received
1	263797	SMR0000271	IVP0000271	SM	11/22/99	GOOD 11/29/99
2	263798	SMR0000272	IVP0000272	SM	11/22/99	GOOD 11/29/99
3	263799	SMR0000273	IVP0000273	SM	11/22/99	GOOD 11/29/99
4	263800	SMR0000274	IVP0000274	SM	11/22/99	GOOD 11/29/99
5	263801	SMR0000275	IVP0000275	SM	11/22/99	GOOD 11/29/99
6	263802	SMR0000276	IVP0000276	SM	11/22/99	GOOD 11/29/99
7	263803	SMR0000277	IVP0000277	SM	11/22/99	GOOD 11/29/99
8	263804	SMR0000278	IVP0000278	SM	11/22/99	GOOD 11/29/99
9	263805	SMR0000279	IVP0000279	SM	11/22/99	GOOD 11/29/99
10	263806	SMR0000280	IVP0000280	SM	11/22/99	GOOD 11/29/99
11	263807	SMR0000281	IVP0000281	SM	11/22/99	GOOD 11/29/99
12	263808	SMR0000282	IVP0000282	SM	11/22/99	GOOD 11/29/99
13	263809	SMR0000283	IVP0000283	SM	11/22/99	GOOD 11/29/99
14	263810	SMR0000284	IVP0000284	SM	11/22/99	GOOD 11/29/99
15	263811	SMR0000285	IVP0000285	SM	11/22/99	GOOD 11/29/99
16	263812	SMR0000286	IVP0000286	SM	11/22/99	GOOD 11/29/99
17	263813	SMR0000287	IVP0000287	SM	11/22/99	GOOD 11/29/99
18	263814	SMR0000288	IVP0000288	SM	11/23/99	GOOD 11/29/99

Reviewed By: Sue Spate

413

SECTION III

Sample	Ticket	Customer Id	Sample Type	Date Sampled	Condition	Date Received	
19	263815	SMR0000289	IVP0000289	SM	11/23/99	GOOD	11/29/99
20	263816	SMR0000290	IVP0000290	SM	11/23/99	GOOD	11/29/99
21	263817	SMR0000291	IVP0000291	SM	11/23/99	GOOD	11/29/99
22	263818	SMR0000292	IVP0000292	SM	11/23/99	GOOD	11/29/99
23	263819	SMR0000293	IVP0000293	SM	11/23/99	GOOD	11/29/99
24	263820	SMR0000294	IVP0000294	SM	11/23/99	GOOD	11/29/99
25	263821	SMR0000295	IVP0000295	SM	11/23/99	GOOD	11/29/99
26	263822	SMR0000296	IVP0000296	SM	11/23/99	GOOD	11/29/99
27	263823	SMR0000297	IVP0000297	SM	11/23/99	GOOD	11/29/99
28	263824	SMR0000298	IVP0000298	SM	11/23/99	GOOD	11/29/99
29	263825	SMR0000299	IVP0000299	SM	11/23/99	GOOD	11/29/99
30	263826	SMR0000597	IVP0000597	SM	11/23/99	GOOD	11/29/99
31	263827	SMR0000598	IVP0000598	SM	11/23/99	GOOD	11/29/99
32	263828	SMR0000599	IVP0000599	SM	11/23/99	GOOD	11/29/99
33	263829	MED0000271	IVP0000271	CM	11/23/99	GOOD	11/29/99
34	263830	MED0000272	IVP0000272	CM	11/23/99	GOOD	11/29/99
35	263831	MED0000273	IVP0000273	CM	11/23/99	GOOD	11/29/99
36	263832	MED0000274	IVP0000274	CM	11/23/99	GOOD	11/29/99
37	263921	MED0000275	IVP0000275	CM	11/29/99	GOOD	11/30/99
38	263922	MED0000276	IVP0000276	CM	11/29/99	GOOD	11/30/99
39	263923	MED0000277	IVP0000277	CM	11/29/99	GOOD	11/30/99
40	263924	MED0000278	IVP0000278	CM	11/29/99	GOOD	11/30/99
41	263925	MED0000279	IVP0000279	CM	11/29/99	GOOD	11/30/99
42	263926	MED0000281	IVP0000281	CM	11/29/99	GOOD	11/30/99
43	263927	MED0000282	IVP0000282	CM	11/29/99	GOOD	11/30/99
44	263928	MED0000283	IVP0000283	CM	11/29/99	GOOD	11/30/99
45	263929	MED0000284	IVP0000284	CM	11/29/99	GOOD	11/30/99
46	263930	MED0000285	IVP0000285	CM	11/29/99	GOOD	11/30/99
47	263931	MED0000286	IVP0000286	CM	11/29/99	GOOD	11/30/99
48	263932	MED0000287	IVP0000287	CM	11/29/99	GOOD	11/30/99
49	263933	MED0000288	IVP0000288	CM	11/29/99	GOOD	11/30/99
50	263934	MED0000289	IVP0000289	CM	11/29/99	GOOD	11/30/99
51	263935	MED0000290	IVP0000290	CM	11/29/99	GOOD	11/30/99
52	263936	MED0000291	IVP0000291	CM	11/29/99	GOOD	11/30/99
53	263937	MED0000292	IVP0000292	CM	11/29/99	GOOD	11/30/99
54	263938	MED0000293	IVP0000293	CM	11/29/99	GOOD	11/30/99
55	263939	MED0000294	IVP0000294	CM	11/29/99	GOOD	11/30/99
56	263940	MED0000295	IVP0000295	CM	11/29/99	GOOD	11/30/99
57	263941	MED0000296	IVP0000296	CM	11/29/99	GOOD	11/30/99
58	263942	MED0000297	IVP0000297	CM	11/29/99	GOOD	11/30/99
59	263943	MED0000298	IVP0000298	CM	11/29/99	GOOD	11/30/99
60	263944	MED0000299	IVP0000299	CM	11/29/99	GOOD	11/30/99

Reviewed By: Joe Lopez

414

H&S Request for Analytical Service

Final Report to J. Lively
Office/Tech. Bldg 3022, 206A
Project Rocky Flats IVP
Area Building 779 Cluster
Site ID No. Survey Unit 779-35
Number of Samples 32

Requisition No. 16848
Project No. 342303001
Date Submitted 11-29-99

Results Required

- Immediate: 1 to 16 hours
- Expedite: up to 48 hours
- Normal schedule: 4 to 14 days
- Delay acceptable: more than 14 days

• Justification _____

Analysis Required

- Airborne Silica
- Airborne Asbestos
- Airborne Radioparticulate
- Bulk
 - Asbestos
 - Soil
 - Metals
 - Water
 - Other
- Elemental (Use Symbol)
 - As Ba Cd Cr Pb Hg Se Ag
- Isotope (Use Symbol)
 - Ra-226 Th-230 U-Nat Po-210 _____ _____
- Other Analysis GROSS ALPHA/BETA SMEAR COUNTING
 - Volatiles
 - Semi-volatiles
 - PCBs
 - pH
 - Ignitability

Special Instructions Retain samples until determined
by Jeff Lively CRDL = 2.5 pli / sample

Sample Disposition: Return Store Destroy

[Signature] _____ 11-24-99
H&S Representative Signature and Approval Date

H&S Request for Analytical Service

Final Report to J Lively

Requisition No. 16848

Office/Tech. Bldg 3022, 206A

Project No. 342303001

Project Rocky Flats IVP

Date Submitted 11-29-99 / 11/30/99

Area Building 779 Cluster

Results Required

Site ID No. Survey Unit 779-35

- Immediate: 1 to 16 hours
- Expedite: up to 48 hours
- Normal schedule: 4 to 14 days
- Delay acceptable: more than 14 days

Number of Samples 4 + 24 = 28

* Justification _____

Analysis Required

- Airborne Silica
- Airborne Asbestos
- Airborne Radioparticulate
- Bulk
 - Asbestos
 - Soil
 - Metals
 - Water
 - Other Concrete, cinder Block
- Elemental (Use Symbol)

- As
- Ba
- Cd
- Cr
- Pb
- Hg
- Se
- Ag

Isotope (Use Symbol)

- Ra-226
- Th-230
- U-Nat
- Po-210
- Pu-238
- U-235
- U-238
- Am-241

Other Analysis

- Volatiles
- Semi-volatiles
- PCBs
- pH
- Ignitability

Special Instructions Retain samples until determined by

Jeff Lively
CRDL = 2.5 pli / sample per nuclide

Sample Disposition: Return Store Destroy

[Signature]
H&S Representative Signature and Approval

11-24-99
Date

16848

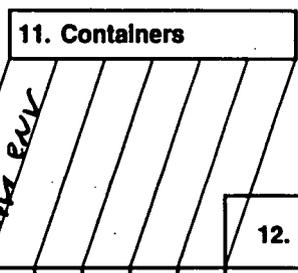
Grand Junction Office

2597 B 3/4 Road
Grand Junction, Colorado 81503
Telephone (970) 248-6000

Chain-of-Sample Custody

1. Page 1 of 3
2. Date 11-23-99

3. Project Name Rocky Flats IVP
4. Site Location _____



5. Sampler (print name) JAY CAMERON

6. Sample No.	7. Date	8. Time	9. Sample Location	10. Sample Matrix	11. Containers						12. Remarks	13. Condition Received
<u>SMR INP0000271</u>	<u>11-22-99</u>	<u>NA</u>	<u>INP0000271</u>	<u>SMears</u>								
<u>272</u>			<u>272</u>									
<u>273</u>			<u>273</u>									
<u>274</u>			<u>274</u>									
<u>275</u>			<u>275</u>									
<u>276</u>			<u>276</u>									
<u>277</u>			<u>277</u>									
<u>278</u>			<u>278</u>									
<u>279</u>			<u>279</u>									
<u>280</u>			<u>280</u>									
<u>281</u>			<u>281</u>									
<u>282</u>			<u>282</u>									
<u>283</u>			<u>283</u>									

14. Relinquished by (signature) <u>Jay Cameron</u>		Date <u>11/29/99</u>	Time <u>0820</u>	Relinquished by (signature)		Date	Time	Relinquished by (signature)		Date	Time
Received by (signature) <u>J. M. Jones</u>		Date <u>11-23-99</u>	Time <u>920</u>	Received by (signature)		Date	Time	Received by (signature)		Date	Time

15. Method of Shipment _____ 16. Laboratory/Destination _____ 17. Airbill or Receipt Number _____

18. For Contract Laboratories Only—Receiver to sign, date, and return form by mail or with analytical data package

Company Name _____ Received by _____ Date _____

SECTION III

417

5

Grand Junction Office

2597 B 3/4 Road
Grand Junction, Colorado 81503
Telephone (970) 248-6000

Chain-of-Sample Custody

16848

1. Page 2 of 3
2. Date 11-13-99

3. Project Name Rocky Flats IUP

4. Site Location _____

11. Containers

MAY QUV									
---------	--	--	--	--	--	--	--	--	--

5. Sampler (print name) JAY CAMERON

6. Sample No.	7. Date	8. Time	9. Sample Location	10. Sample Matrix	11. Containers					12. Remarks	13. Condition Received
SMR0000284	11-22-99	NA	NP0000 284	SMEAR							
285	↓		285								
286	↓		286								
287	↓		287								
288	11-23-99		288								
289	↓		289								
290	↓		290								
291	↓		291								
292	↓		292								
293	↓		293								
294	↓		294								
295	↓		295								
296	↓		296								

14. Relinquished by (signature) <u>Jay Cameron</u>		Date	Time	Relinquished by (signature)		Date	Time	Relinquished by (signature)		Date	Time
Received by (signature) <u>JM Davis</u>		Date	Time	Received by (signature)		Date	Time	Received by (signature)		Date	Time
		11/29/99	0820								
		11-29-99	830								

15. Method of Shipment _____ 16. Laboratory/Destination _____ 17. Airbill or Receipt Number _____

18. For Contract Laboratories Only—Receiver to sign, date, and return form by mail or with analytical data package
Company Name _____ Received by _____ Date _____

418

SECTION III

16848

Grand Junction Office

2597 B 3/4 Road
Grand Junction, Colorado 81503
Telephone (970) 248-6000

Chain-of-Sample Custody

1. Page 1 of
2. Date 11/29/99

3. Project Name Rocky Flats IVP

4. Site Location 779-35

5. Sampler (print name) A. Samilan

11. Containers

6. Sample No.	7. Date	8. Time	9. Sample Location	10. Sample Matrix	11. Containers					12. Remarks	13. Condition Received	
MED0000275	11-29-99	N/A	1100000 275	Concrete	1							
276			276		1							
277			277		1							
278			278		1							
279			279		1							
281			281		1							
282			282		1							
283			283		1							
284			284		1							
285			285		1							
286			286		1							
287			287		1							
288			288		1							

14. Relinquished by (signature) <i>A. Samilan</i>		Date	Time	Relinquished by (signature)		Date	Time	Relinquished by (signature)		Date	Time
Received by (signature) <i>J. Saloney</i>		Date	Time	Received by (signature) <i>J. Saloney</i>		Date	Time	Received by (signature)		Date	Time
		11-29-99	16:20			11-30-99	11:00				

15. Method of Shipment 16. Laboratory/Destination 17. Airbill or Receipt Number

18. For Contract Laboratories Only—Receiver to sign, date, and return form by mail or with analytical data package

Company Name Received by Date

Preparation instructions on back of form. Distribution: Original accompanies shipment, copies to relinquisher.

SECTION 44

GJO 1512
597
420

WET CHEMISTRY
SAMPLE PREPARATION FORM

SECTION III

9911648A5 LEB 4/1/99

Requisition: 16848

Project: 342303001

Method: SP-4 R00

Date Started: 11-22-99

Date Completed: 11-30-99

Prep'd By: JD

Verified: SL

Sample	Ticket	Customer ID	Pan #	Dry	Crush	Sample Mesh	Blend	Split Ground	Blend	Final Mesh
263829	MED00002	IVP0000271								
263830	MED00002	IVP0000272								
263831	MED00002	IVP0000273								
263832	MED00002	IVP0000274								
263921	MED00002	IVP0000275								
263922	MED00002	IVP0000276								
263923	MED00002	IVP0000277								
263924	MED00002	IVP0000278								
263925	MED00002	IVP0000279								
263926	MED00002	IVP0000281								
263927	MED00002	IVP0000282								
263928	MED00002	IVP0000283								
263929	MED00002	IVP0000284								
263930	MED00002	IVP0000285								
263931	MED00002	IVP0000286								
263932	MED00002	IVP0000287								
263933	MED00002	IVP0000288								
263934	MED00002	IVP0000289								
263935	MED00002	IVP0000290								
263936	MED00002	IVP0000291								
263937	MED00002	IVP0000292								
263938	MED00002	IVP0000293								
263939	MED00002	IVP0000294								
263940	MED00002	IVP0000295								
263941	MED00002	IVP0000296								
263942	MED00002	IVP0000297								
263943	MED00002	IVP0000298								
263944	MED00002	IVP0000299								

hand ground ≈ 100 *JD 11-22-99*

JD 11-30-99

Property Waste Sample

COPY

RELEASE EVALUATION FORM

Page 1 of 2 *RN 11-24-99*

Release Evaluation No.: 991129-00779-001 EXTENDED: No EXPIRES: n/a Charge No.: n/a

PART I SENDER/CUSTODIAN ACKNOWLEDGEMENT

Description of Property/Waste/Sample To Be Released/Transferred:

24 media samples from B779. Room 222/222A

Current Location: B779 Cluster

Destination: GJO Analytical Chemistry Laboratory. Grand Junction. CO.

New Recipient/Custodian: Ron Chessmore (970) 248-6166

History/Process Knowledge: Smears obtained for independent verification (IV) after final survey.

Has the specified material ever been in an RMMA/RBA/CA or contacted DOE controlled radioactive materials? Yes. B779

Main building. Rooms 222/222A were part of a CA. (see notes below)

- 1) By signing below, I certify information provided in Part I of this release evaluation to be true and accurate.
- 2) By signing below, I agree to comply with the specific requirements noted in Part II of this release evaluation.

Sender/Custodian: *Art Samilian* Employee No. [REDACTED] Date: 11/23/99 Ext 2863 Pager N/A

PART II RADIOLOGICAL ENGINEERING

SPECIFIC REQUIREMENTS AND/OR COMMENTS:

Room 222, located on the second floor of B779 Main, was remediated prior to final survey. Room 222A was remediated; however, final status survey in this 41 m² area has not been performed yet due to ongoing decon activities. Paint was removed from both rooms by hydrolasing and/or scabbling. Room 222 was sampled for final status survey in accordance with MARSSIM gridding methodology and 31 alpha TSA/removable contamination sample locations were measured. All measurements obtained to date for final status survey indicate no alpha contamination above the unrestricted release limits of 100 dpm/100 cm² (total) or 20 dpm/100 cm² (removable) exists in Room 222. Therefore the independent verification media samples obtained from Room 222 do not require rad screens.

Evaluated: *S Roberts / J Roberts* Emp. No. [REDACTED] Date: 11/29/99 Ext: 3008 Pager 6209
Radiological Engineer

APPROVAL FOR TRANSFER/SHIPMENT

Approved: *Rock Henry* Emp. No. [REDACTED] Date: 11/29/99 Ext: 3461 Pager 2581
Radiological Engineer

PROPERTY/WASTE RELEASE EVALUATION SIGNATURE REQUIREMENTS

Release Evaluation #: 991129-00779-001 Page 2 of 2**COPY****Release Evaluation for Waste:**

A Release Evaluation for Waste requires an evaluation and unrestricted release approval signature. The evaluation signature is by the Radiological Engineer (RE) providing the methods or criteria for unrestricted release (i.e., survey requirements, analytical requirements, no survey required, etc.). The unrestricted release approval signature for a Release Evaluation for Waste shall be a RE authorized to provide unrestricted release approval. In addition, the evaluation and unrestricted release approval signatures shall not be the same RE. The intent of this provision is to provide peer review of the evaluation and method of unrestricted release. It is important the RE take the peer review process seriously and not become a "rubber stamp" for their fellow engineer.

Release Evaluation for Property:

A Release Evaluation for Property requires an evaluation and unrestricted release approval signature. For a Release Evaluation for Property, the evaluation and unrestricted release signature may be the same RE. In the past, only one signature was required for property for which a RE could provide an unrestricted release on the basis of process knowledge/history.

Release Evaluation for Samples:

Samples are any waste or material that is being shipped to an off-site facility for analysis. Samples that may be provided with an unrestricted release using process knowledge/history or standard contamination survey techniques may be authorized for shipment to an off-site facility using the signatory requirements specified for property. Samples which cannot be provided with an unrestricted release using process knowledge/history or standard contamination survey techniques shall be authorized for shipment from the Site using the methodology specified for waste, i.e., second signature being provided by a RE authorized to perform peer review and approval for shipment.

The approval for transfer/shipment section of a Sample Release Evaluation (SRE) shall be revised as noted below for samples which cannot be provide with an unrestricted release.

"The samples specified in Part 1 of this release evaluation are being provided with authorization for transport as non-radioactive materials in accordance with Department of Transportation (49 CFR) regulation. This authorization for shipment does not constitute an unrestricted release."

Additional Documentation:

Number of lines per section may be modified or additional pages attached to ensure adequate documentation of information necessary to perform release evaluation.

Additional pages or attachments to a release evaluation shall have the evaluation number, Page __ of __, initials of Radiological Engineer signing approval for transfer/shipment and date.

LABORATORY SAMPLE TRACKING RECORD

292

Requisition: 16848 Project: 342303001 Requestor: JEFF LIVELY Building 20 Received: 11/30/99

RCVD FROM	RCVD BY	DATE	STORAGE LOCATION	FOR	SAMPLES	CHECK-OUT DATE	INIT	CHECK-IN DATE	INIT	RETURN LOCATION	O D E C			DISPOSAL		D	C	W	
															INIT				DATE
<i>20</i>	<i>S.L.</i>	<i>11/30/99</i>	<i>3G3</i>	<i>AM241</i>	<i>263921-263944</i>	<i>12/1/99</i>	<i>BT</i>	<i>12/20/99</i>	<i>BT</i>	<i>363</i>									
	<i>20</i>		<i>AM143</i>	<i>M1</i>	<i>263921-263944</i>	<i>11-30-99</i>	<i>20</i>	<i>11-30-99</i>	<i>20</i>	<i>AM143</i>	<i>X</i>								
	<i>S.L.</i>		<i>3G3</i>	<i>PUISO</i>	<i>263921-263944</i>														
				<i>UISO</i>	<i>263921-263944</i>														

SECTION III

TYPE CODES: O = Original D = Digest E = Extract C = Consumed

DISPOSAL CODES: D = Discard C = Customer W = Waste Management

SAMPLES RETURNED: *BT* , *RES* , *122099*
 To Sample Plant BY TO DATE

SAMPLE DISPOSITION: D C W /
 BY DATE

Requisition: 16848

Requisition: 16848

425

Appendix D

Background Sample Data

INDEPENDENT VERIFICATION INSTRUMENT BACKGROUND DATA SHEET

22 A/E

Survey Location: RFETS, 779 Cluster / Building Survey Unit: 779-35 Date: 11/23/99
 Instrument Model Number: Eberline, E 600 Instrument ID Number: 15622 (4321) Calibration Expires: 3-23-00
 Detector Probe Type: Eberline, HP-100 Operator Name: JAY CAMERON Signature: Jay Cameron

Sample ID No. (Alt or Record Background Bar Code)	Time	Measurement Type	Static Count Time (minutes)	HP-100 Probe ID #	GROSS Instrument Reading (cpm/100 cm)	Comments (Include reason for background measurement)
BACKGROUND	0930	Direct Static Background Measurement	1.5 Minute	16338 #140	12.41	START OF SURVEY
BACKGROUND	0933	Direct Static Background Measurement	1.5 Minute		20.6	↓
BACKGROUND	0935	Direct Static Background Measurement	1.5 Minute		16.6	
BACKGROUND	1040	Direct Static Background Measurement	1.5 Minute		12.42	END OF SURVEY
BACKGROUND	1042	Direct Static Background Measurement	1.5 Minute		12.41	↓
BACKGROUND	1044	Direct Static Background Measurement	1.5 Minute		4.14	
BACKGROUND	1315	Direct Static Background Measurement	1.5 Minute		24.8	START OF SURVEY

Form IVP-1001, July 1999
 Supervisory Review: A. Samiljan Date: 11-24-99 File Index Number: _____
 Signature: _____ Date: _____
 Print Name: _____

INDEPENDENT VERIFICATION INSTRUMENT BACKGROUND DATA SHEET

Survey Location: RFETS 779 Cluster / Building Survey Unit: 271-35 Date: 11-22-99
 Instrument Model Number: Eberline, E 500 Instrument ID Number: 15622 (*221) Calibration Expires: 3.23.00
 Detector Probe Type: Eberline, HP-100 Operator Name: Jay Cameron Signature: Jay Cameron

Sample ID No. (Att. or Record Background Bar Code)	Time	Measurement Type	Static Count Time (minutes)	HP-100 Probe ID#	GROSS Instrument Reading (dpm/100 cm ²)	Comments (Include reason for background measurement)
BACKGROUND	1217	Direct Static Background Measurement	1.5 Minute	16338 #140	20.6	START OF SURVEY
BACKGROUND	1320	Direct Static Background Measurement	1.5 Minute		12.41	↓
BACKGROUND	1420	Direct Static Background Measurement	1.5 Minute		24.8	END OF SURVEY
BACKGROUND	1422	Direct Static Background Measurement	1.5 Minute		24.8	
BACKGROUND	1424	Direct Static Background Measurement	1.5 Minute		16.55	↓
BACKGROUND		Direct Static Background Measurement	1.5 Minute			
BACKGROUND		Direct Static Background Measurement	1.5 Minute			

method's follows
 #140's of #140

Form IVP-1001, July 1999
 Supervisory Review: A. Samalitan Signature: A. Samalitan Date: 11-24-99 File Index Number: _____
 Print Name: _____

INDEPENDENT VERIFICATION INSTRUMENT BACKGROUND DATA SHEET

Survey Location: RFETS, 779 Cluster / Building Survey Unit: 779-35 Date: 11-23-98
 Instrument Model Number: Eberline, E 600 Instrument ID Number: 15622 (#321) Calibration Expires: 3-23-00
 Detector Probe Type: Eberline, HP-100 Operator Name: JAY CAMERON Signature: Jay Cameron

Sample ID No. (Affix or Record Background Bar Code)	Time	Measurement Type	Static Count Time (minutes)	HP-100 Probe ID#	GROSS Instrument Reading (dpm/100 cm ²)	Comments (Include reason for background measurement)	
BACKGROUND	0936	Direct Static Background Measurement	1.5 Minute	15564 #109	10.97	START OF SURVEY	
BACKGROUND	0938	Direct Static Background Measurement	1.5 Minute	↓	14.20	↓	
BACKGROUND	0940	Direct Static Background Measurement	1.5 Minute		14.42		
BACKGROUND	1046	Direct Static Background Measurement	1.5 Minute		4.27		1 hour check
BACKGROUND	1048	Direct Static Background Measurement	1.5 Minute		17.69		
BACKGROUND	1050	Direct Static Background Measurement	1.5 Minute		10.83		
BACKGROUND	1120	Direct Static Background Measurement	1.5 Minute		13.65 MP 17.89		END OF SURVEY

Form IVP-1001, July 1999

Supervisory Review: A. Samikhan , A. Samikhan , 11-24-99 File Index Number _____
 Print Name Signature Date

428

INDEPENDENT VERIFICATION INSTRUMENT BACKGROUND DATA SHEET

Survey Location: RFETS, 779 Cluster / Building Survey Unit: 779-35 Date: 11/23/99

Instrument Model Number: Eberline, E 600 Instrument ID Number: 15222 (#321) Calibration Expires: 3-23-00

Detector Probe Type: Eberline, HP-100 Operator Name: Jay Cameron Signature: Jay Cameron

Sample ID No. (Artic. or Record Background Bar Code)	Time	Measurement Type	Static Count Time (minutes)	HP-100 Probe ID#	GROSS Instrument Reading (dpm/100 cm ²)	Comments (include reason for background measurement)
--	------	------------------	-----------------------------	------------------	---	--

1123	1.5 Minute	Direct Static Background Measurement	1.5 Minute	15564 #109	18.03	END OF SURVEY
1125	1.5 Minute	Direct Static Background Measurement	1.5 Minute		14.62	

BACKGROUN	1.5 Minute	Direct Static Background Measurement	1.5 Minute			
BACKGROUN	1.5 Minute	Direct Static Background Measurement	1.5 Minute			
BACKGROUN	1.5 Minute	Direct Static Background Measurement	1.5 Minute			
BACKGROUN	1.5 Minute	Direct Static Background Measurement	1.5 Minute			
BACKGROUN	1.5 Minute	Direct Static Background Measurement	1.5 Minute			

nothing below

Form IVP-1001, July 1999

Supervisory Review:

A. Samlins

Print Name

Signature

11-24-99

Date

File Index Number

429

INDEPENDENT VERIFICATION INSTRUMENT BACKGROUND DATA SHEET

Survey Location: RFETS, 779 Cluster / Building Survey Unit: 779-35 Date: 11-30-99
 Instrument Model Number: Eberline, E 600 Instrument ID Number: 15622 (#321) Calibration Expires: 3-23-00
 Detector Probe Type: Eberline, HP-100 Operator Name: A. Samikra Signature: [Signature]

Sample ID No. (Affix or Record Background Bar Code)	Time	Measurement Type	Static Count Time (minutes)	HP-100 Probe ID#	GROSS Instrument Reading (dpm/100 cm ²)	Comments (Include reason for background measurement)	
BACKGROUND	1332	Direct Static Background Measurement	1.5 Minute	15664 #109	17.99	START OF SURVEY	
BACKGROUND	1334	Direct Static Background Measurement	1.5 Minute	↓	11.06	↓	
BACKGROUND	1336	Direct Static Background Measurement	1.5 Minute		11.11		
BACKGROUND	1445	Direct Static Background Measurement	1.5 Minute		21.4		1 hr Check
BACKGROUND	1447	Direct Static Background Measurement	1.5 Minute		14.24		
BACKGROUND	1450	Direct Static Background Measurement	1.5 Minute		14.52		
BACKGROUND	1613	Direct Static Background Measurement	1.5 Minute		11.56		END OF SURVEY

Form IVP-1001, July 1999

Supervisory Review: A. Samikra, [Signature], 11-30-99 File Index Number _____
 Print Name Signature Date

430

INDEPENDENT VERIFICATION INSTRUMENT BACKGROUND DATA SHEET

Survey Location: RFETS, 779 Cluster / Building Survey Unit: 779-35 Date: 11-30-99
 Instrument Model Number: Eberline, E 600 Instrument ID Number: 15622 (#321) Calibration Expires: 3-23-00
 Detector Probe Type: Eberline, HP-100 Operator Name: A. Sami / Jan Signature: [Signature]

Sample ID No. (Link or Record Background Bar Code)	Time	Measurement Type	Static Count Time (minutes)	HP-100 Probe ID #	GROSS Instrument Reading (cpm/100 cm)	Comments (include reason for background measurement)
BACKGROUND	1615	Direct Static Background Measurement	1.5 Minute	15664 # 109	11.47	END OF SURVEY
BACKGROUND	1617	Direct Static Background Measurement	1.5 Minute	↓	15.04	↓
BACKGROUND		Direct Static Background Measurement	1.5 Minute			
BACKGROUND		Direct Static Background Measurement	1.5 Minute			
BACKGROUND		Direct Static Background Measurement	1.5 Minute			
BACKGROUND		Direct Static Background Measurement	1.5 Minute			
BACKGROUND		Direct Static Background Measurement	1.5 Minute			
BACKGROUND		Direct Static Background Measurement	1.5 Minute			

Form IVP-1001, July 1999
 Supervisory Review: A. Sami / Jan Signature: [Signature] Date: 11-30-99 File Index Number: _____
 Print Name: _____

INDEPENDENT VERIFICATION INSTRUMENT RESPONSE CHECK DATA SHEET

Survey Location: RFETS, 779 Cluster / Building

Survey Unit: 779-35

Date: 11-22-99

Instrument Model Number: Eberline, E 600

Instrument ID Number: 15622 (#321)

Calibration Expires: 3-23-00

Detector Probe Type: Eberline, HP-100

Operator Name: JAY CAMERON

Signature: Jay Cameron

Sample ID No. (Affix or Record Background Bar Code)	Time	Measurement Type	Static Count Time (minutes)	HP-100 Probe ID#	GROSS Instrument Reading (dpm/100 cm ²)	Accept		Comments (Include reason for response check/measurement)
						YES	NO	
 RESP/CHECK	0938	Direct Static Measurement Response Check	1.5 Minute	16338 #140	1618	✓		START OF SURVEY
 RESP/CHECK	0940	Direct Static Measurement Response Check	1.5 Minute		1805	✓		↓
 RESP/CHECK	0942	Direct Static Measurement Response Check	1.5 Minute		1655	✓		
 RESP/CHECK	1055	Direct Static Measurement Response Check	1.5 Minute		1758	✓		
 RESP/CHECK	1100	Direct Static Measurement Response Check	1.5 Minute		1791	✓		↓
 RESP/CHECK	1102	Direct Static Measurement Response Check	1.5 Minute		1924	✓		
 RESP/CHECK	1326	Direct Static Measurement Response Check	1.5 Minute		1738	✓		START OF SURVEY

Form IVP-1002, July 1999

Supervisory Review: A. Samir

Print Name

A. Samir

Signature

11-24-99

Date

File Index Number

432

INDEPENDENT VERIFICATION INSTRUMENT RESPONSE CHECK DATA SHEET

Survey Location: RFETS, 779 Cluster / Building
 Survey Unit: 279-35
 Date: 11-22-99
 Instrument Model Number: Eberline, E 600
 Instrument ID Number: 15622 (#321)
 Calibration Expires: 3-23-00
 Detector Probe Type: Eberline, HP-100
 Operator Name: DRY CAMERON
 Signature: *[Signature]*

Sample ID No.	Attix or Record Background Bar Code	Measurement TV/pt	Static Count Time (minutes)	HP-100 Probe ID	GROSS Instrument Reading (dpm/100cm ²)	SEI	ON	Comments (include reason for response check/measurement)
---------------	-------------------------------------	-------------------	-----------------------------	-----------------	--	-----	----	--

1328		Measurement	1.5 Minute	16338 #140	1862	✓		START OF SURVEY
1331		Direct Static Measurement Response Check	1.5 Minute		1816	✓		
1410		Direct Static Measurement Response Check	1.5 Minute		1655	✓		END OF SURVEY
1412		Direct Static Measurement Response Check	1.5 Minute		1907	✓		
1414		Direct Static Measurement Response Check	1.5 Minute		1829	✓		
		Direct Static Measurement Response Check	1.5 Minute					
		Direct Static Measurement Response Check	1.5 Minute					

Problems follow

Form IVP-1002, July 1999

Supervisory Review: *[Signature]* 433

Print Name

Signature

Date

11-24-99

File Index Number

Survey Location: RFETS, 779 Cluster / Building Survey Unit: 779-35 Date: 11-23-99
 Instrument Model Number: Eberline, E 600 Instrument ID Number: 15622 (#321) Calibration Expires: 3-23-00
 Detector Probe Type: Eberline, HP-100 Operator Name: JAY CAMERON Signature: Jay Cameron

Sample ID No. (Affix or Record Background Bar Code)	Time	Measurement Type	Static Count Time (minutes)	HP-100 Probe ID	GROSS Instrument Reading (dpm/100cm)	Accept		Comments (Include reason for response check measurement)
						YES	NO	
RESP/CHECK	0930	Direct Static Measurement Response Check	1.5 Minute	15564 #109	1543	✓		START OF SURVEY
RESP/CHECK	0932	Direct Static Measurement Response Check	1.5 Minute		1458	✓		↓
RESP/CHECK	0934	Direct Static Measurement Response Check	1.5 Minute		1491	✓		
RESP/CHECK	1040	Direct Static Measurement Response Check	1.5 Minute		1498	✓	1 hour check	
RESP/CHECK	1042	Direct Static Measurement Response Check	1.5 Minute		1413	✓		
RESP/CHECK	1044	Direct Static Measurement Response Check	1.5 Minute		1495	✓		
RESP/CHECK	1115	Direct Static Measurement Response Check	1.5 Minute		1529	✓		
RESP/CHECK								

Form IVP-1002, July 1999

Supervisory Review: A. SAMILWAN, A. Samilwan, 11-24-99 File Index Number _____
 Print Name Signature Date

434

INDEPENDENT VERIFICATION INSTRUMENT RESPONSE CHECK DATA SHEET

Survey Location: RFETS, 779 Cluster / Building Survey Unit: 779-35 Date: 11-30-99
 Instrument Model Number: Eberline, E 600 Instrument ID Number: 15622 (#321) Calibration Expires: 3-23-00
 Detector Probe Type: Eberline, HP-100 Operator Name: A. SAMILJAN Signature: [Signature]

Sample ID No. (Affix or Record Background Bar Code)	Time	Measurement Type	Static Count Time (minutes)	HP-100 Probe ID#	GROSS Instrument Reading (dpm/100cm ²)	Accept		Comments (Include reason for response check/measurement)
						Y E S	N O	
RESP/CHECK	1328	Direct Static Measurement Response Check	1.5 Minute	15664 #109	1498	✓		START OF SURVEY
RESP/CHECK	1330	Direct Static Measurement Response Check	1.5 Minute	↓	1497	✓		↓
RESP/CHECK	1332	Direct Static Measurement Response Check	1.5 Minute		1521	✓		
RESP/CHECK	1439	Direct Static Measurement Response Check	1.5 Minute		1485	✓		
RESP/CHECK	1441	Direct Static Measurement Response Check	1.5 Minute		1434	✓		
RESP/CHECK	1443	Direct Static Measurement Response Check	1.5 Minute		1487	✓		↓
RESP/CHECK	1604	Direct Static Measurement Response Check	1.5 Minute		1376	✓		END OF SURVEY

Form IVP-1002, July 1999

Supervisory Review: A. Samiljan, [Signature], 11-30-99 File Index Number _____
 Print Name Signature Date

436

INDEPENDENT VERIFICATION INSTRUMENT RESPONSE CHECK DATA SHEET

Survey Location: RFETS, 779 Cluster / Building Survey Unit: 779-35 Date: 11-30-99
 Instrument Model Number: Eberline, E 600 Instrument ID Number: 15622 (#321) Calibration Expires: 3-23-00
 Detector Probe Type: Eberline, HP-100 Operator Name: A. Samilwan Signature: [Signature]

Sample ID No. (Affix or Record Background Bar Code)	Time	Measurement Type	Static Count Time (minutes)	HP-100 Probe ID	GROSS Instrument Reading (dpm/100 cm)	Accept		Comments (Include reason for response check measurement)
						YES	NO	
RESP/CHECK	1608	Direct Static Measurement Response Check	1.5 Minute	15664 #109	1351	✓		END OF SURVEY
RESP/CHECK	1610	Direct Static Measurement Response Check	1.5 Minute	↓	1406	✓		↓
RESP/CHECK		Direct Static Measurement Response Check	1.5 Minute					
RESP/CHECK		Direct Static Measurement Response Check	1.5 Minute					
RESP/CHECK		Direct Static Measurement Response Check	1.5 Minute					
RESP/CHECK		Direct Static Measurement Response Check	1.5 Minute					
RESP/CHECK		Direct Static Measurement Response Check	1.5 Minute					

nothing follows

Form IVP-1002, July 1999

Supervisory Review: A. Samilwan [Signature] 11-30-99
 Print Name Signature Date
 437

File Index Number _____

INDEPENDENT VERIFICATION SURVEY DATA SHEET

Survey Location: RFETS, 779 Cluster / Building Survey Unit: 779-35 Date: 11-22-99
 Instrument Model Number: Eberline, E 600 Instrument ID Number: 15622 (#321) Calibration Expires: 3/23/00
 Detector Probe Type: Eberline, HP-100 Operator Name: JAY CAMERON Signature: Jay Cameron

Sample Location / or Sample ID (Affix or record Bar Code?)	Time	Sample or Measurement Type	HP-100 Probe ID Number	Static Count Time	GROSS Instrument Reading (cpm/100 cm)	Comments (Include description of surface characteristics and media composition, as applicable)
 IVP0000271	0942	Direct Static Measurement	16338 # 140	1.5 Minute	8.3	Concrete
 IVP0000272	0944	Direct Static Measurement		1.5 Minute	16.55	
 IVP0000273	0946	Direct Static Measurement		1.5 Minute	16.55	
 IVP0000274	0950	Direct Static Measurement		1.5 Minute	12.4	
 IVP0000275	0953	Direct Static Measurement		1.5 Minute	16.55	
 IVP0000276	0956	Direct Static Measurement		1.5 Minute	8.27	
<i>duplicate 276</i>	0958	Direct Static Measurement		1.5 Minute	8.27	

Form IVP-1000, July 1999

Supervisory Review: A. Samir A. Samir 11-24-99 File Index Number _____
 Print Name Signature Date

438

INDEPENDENT VERIFICATION SURVEY DATA SHEET

Survey Location: RFETS, 779 Cluster / Building Survey Unit: 779-35 Date: 11-22-99
 Instrument Model Number: Eberline, E 600 Instrument ID Number: 15622 (#321) Calibration Expires: 3-23-00
 Detector Probe Type: Eberline, HP-100 Operator Name: JAY CAMERON Signature: Jay Cameron

Sample Location / or Sample ID (Affix or record Bar Code)	Time	Sample or Measurement Type	HP-100 Probe ID Number	Static Count Time	GROSS Instrument Reading (cpm/0.06cm)	Comments (Include description of surface characteristics and media composition, as applicable)
 IVP0000277	1005	Direct Static Measurement	16338 #140	1.5 Minute	4.13	Concrete
 IVP0000278	1010	Direct Static Measurement		1.5 Minute	16.55	
 IVP0000279	1025	Direct Static Measurement		1.5 Minute	16.55	
 IVP0000280	1030	Direct Static Measurement		1.5 Minute	4.13	
 IVP0000281	1035	Direct Static Measurement		1.5 Minute	4.13	
 IVP0000282	1335	Direct Static Measurement		1.5 Minute	12.41	
<i>Duplicate 282</i>	1340	Direct Static Measurement	↓	1.5 Minute	12.41	↓

Form IVP-1000, July 1999

Supervisory Review: A. SAMBITAN A. Samitan 11-24-99 File Index Number _____
 439 Print Name Signature Date



INDEPENDENT VERIFICATION SURVEY DATA SHEET

Survey Location: RFETS, 779 Cluster / Building Survey Unit: 779-35 Date: 11/22/99 - 11/23/99
 Instrument Model Number: Eberline, E 600 Instrument ID Number: 15622 (#321) Calibration Expires: 3-23-00
 Detector Probe Type: Eberline, HP-100 Operator Name: Jay Cameron Signature: Jay Cameron

Sample Location: or Sample ID (Attach or record Bar Code)	Time	Sample or Measurement Type	HP-100 Probe ID Number	Static Count Time	GROSS Instrument Reading (cpm/100 cpm)	Comments (include description of surface characteristics and media composition, as applicable)
 IVP0000283	1355	Direct Static Measurement	16338 # 140	1.5 Minute	4.13	Concrete
 IVP0000284	0945 11-23-99	Direct Static Measurement	15564 # 109	1.5 Minute	7.37	
 IVP0000285	0950	Direct Static Measurement		1.5 Minute	20.0	
 IVP0000286	0952	Direct Static Measurement		1.5 Minute	13.19	
 IVP0000287	0955	Direct Static Measurement		1.5 Minute	20.4	
 IVP0000288	1000	Direct Static Measurement		1.5 Minute	6.57	
<i>duplicate 288</i>	1010	Direct Static Measurement		1.5 Minute	9.99	

Form IVP-1000, July 1999

Supervisory Review: A. Samir / JAW , A. Samir , 11-24-99 File Index Number _____
 Print Name Signature Date

440

INDEPENDENT VERIFICATION SURVEY DATA SHEET

Survey Location: REETS, 779 Cluster / Building Survey Unit: 779-35 Date: _____
 Instrument Model Number: Eberline, E-600 Instrument ID Number: 15622 (#321) Calibration Expires: 3-23-00
 Detector Probe Type: Eberline, HP-100 Operator Name: JAY CAMERON Signature: Jay Cameron

Sample Location or Sample ID (Alix or record Bar Code #)	Time	Sampler Measurement Type	HP-100 Probe ID Number	Static Count Time	GROSS Reading (dpm/100 cm)	Comments (Include description of source characteristics and media composition, as applicable)
 IVP0000289	1012	Direct Static Measurement	15564 # 109	1.5 Minute	16.79	Concrete
 IVP0000290	1014	Direct Static Measurement		1.5 Minute	13.41	
 IVP0000291	1020	Direct Static Measurement		1.5 Minute	13.15	
 IVP0000292	1022	Direct Static Measurement		1.5 Minute	16.55	
 IVP0000293	1025	Direct Static Measurement		1.5 Minute	16.36	
 IVP0000294	1030	Direct Static Measurement		1.5 Minute	19.95	
Duplicate 294	1035	Direct Static Measurement		1.5 Minute	16.57	

Form IVP-1000, July 1999
 Supervisory Review: A. Samikhan Signature: A. Samikhan Date: 11-24-99 File Index Number: _____
 44

INDEPENDENT VERIFICATION SURVEY DATA SHEET

Survey Location: REETS_779 Cluster / Building Survey Unit: 779-35 Date: _____
 Instrument Model Number: Eberline, E 600 Instrument ID Number: 15622 (#321) Calibration Expires: 2-23-00
 Detector Probe Type: Eberline_HP-100 Operator Name: JAY CAMERON Signature: Jay Cameron

Sample Location / or Sample ID (Atix or record bar code #)	Time	Sampler/ Measurement Type	HP-100 Probe ID Number	Static Count Time	Gross Instrument Reading (cpm/0.01cm)	Comments (Include description of area or characteristics and media count or other applicable info)
 1VP0000295	1050	Direct Static Measurement	15564 #109	1.5 Minute	20.2	concrete
 1VP0000296	1055	Direct Static Measurement		1.5 Minute	6.17	
 1VP0000297	1100	Direct Static Measurement		1.5 Minute	9.91	
 1VP0000298	1105	Direct Static Measurement		1.5 Minute	13.21	
 1VP0000299	1110	Direct Static Measurement		1.5 Minute	16.86	
<u>Duplicate 299</u>	1112	Direct Static Measurement		1.5 Minute	10.04	
		Direct Static Measurement	<u>AK</u>	1.5 Minute		

Form IVP-1000, July 1999
 Supervisory Review: A. SAMILIAN Signature: A. Samilian Date: 11-24-99 File Index Number: _____
 442

INDEPENDENT VERIFICATION SURVEY DATA SHEET

Survey Location: REETS, 779 Cluster / Building Survey Unit: 779-35 Date: 11-30-99
 Instrument Model Number: Eberline, E.600 Instrument ID Number: 15622 (#321) Calibration Expires: 3-23-00
 Detector Probe Type: Eberline, HP-100 Operator Name: A. Samlivan Signature: [Signature]

Sample Location (Mix or record if possible)	Time	Sampler Measurement Type	HP-100 Probe ID Number	Static Count Time	Grossing Reading (cpm/gram)	Comments (In-Place or on surface characteristics and media composition, if applicable)
IVP000 290	1520	Direct Static Measurement	15564 #109	1.5 Minute	3.46	POST MEDIA SAMPLING
291	1525	Direct Static Measurement		1.5 Minute	17.03	
292	1528	Direct Static Measurement		1.5 Minute	23.09	
293	1532	Direct Static Measurement		1.5 Minute	20.50	
294	1536	Direct Static Measurement		1.5 Minute	7.10	
295	1540	Direct Static Measurement		1.5 Minute	17.30	
296	1548	Direct Static Measurement		1.5 Minute	23.90	

Form IVP-1000, July 1999
 Supervisory Review: A. Samlivan Signature: [Signature] Date: 11-30-99 File Index Number: _____
 Print Name: _____

INDEPENDENT VERIFICATION SURVEY DATA SHEET

Survey Location: RFETS, 779 Cluster / Building Survey Unit: 779-35 Date: 11-30-99
 Instrument Model Number: Eberline, E 600 Instrument ID Number: 15622 (#321) Calibration Expires: 3-23-00
 Detector Probe Type: Eberline, HP-100 Operator Name: A. Samilwan Signature: A. Samilwan

Sample Location or Sample ID (Well or Record Bar Code)	Time	Sample or Measurement Type	HP 100 Probe ID Number	Static Count Time	Gross Instrument Reading (cpm/100 cpm)	Comments (Include description of source characteristics and media composition, as applicable)
IVP 0000 275	1340	Direct Static Measurement	15564 #109	1.5 Minute	10.43	Post media Sampling
276	1342	Direct Static Measurement		1.5 Minute	13.61	
277	1344	Direct Static Measurement		1.5 Minute	7.11	
278	1347	Direct Static Measurement		1.5 Minute	6.47	
279	1400	Direct Static Measurement		1.5 Minute	23.5	
281	1404	Direct Static Measurement		1.5 Minute	6.69	
282	1425	Direct Static Measurement		1.5 Minute	13.23	

Form IVP-1000, July 1999

Supervisory Review: A. Samilwan Signature: A. Samilwan Date: 11-30-99 File Index Number: _____
 444 Print Name Signature Date

Survey Location: RFETS, 779 Cluster/Building
 Survey Unit: 779-35
 Date: 11-30-99
 Instrument Model Number: Eberline, E 600
 Instrument ID Number: 15222 (#321)
 Calibration Expires: 3-23-00
 Operator Name: H. Smiljan
 Signature: *[Signature]*
 Detector Probe Type: Eberline, HP-100

Sample Location (or Sample ID)	Time	Sample or Measurement Type	HP 100 Probe ID Number	Static Equip. Time	Gross Instrument Reading (DPM/100 cm)	Comments (In-Place or Carried, or other details, and media composition, as applicable)
-----------------------------------	------	-------------------------------	------------------------	--------------------------	---	--

WF 0000 283	1428	Direct Static Measurement	15564 #109	1.5 Minute	14.0	Post Media Sampling
284	1432	Direct Static Measurement		1.5 Minute	10.6	
285	1435	Direct Static Measurement		1.5 Minute	9.77	
286	1437	Direct Static Measurement		1.5 Minute	9.80	
287	1501	Direct Static Measurement		1.5 Minute	6.87	
288	1507	Direct Static Measurement		1.5 Minute	7.0	
289	1516	Direct Static Measurement		1.5 Minute	16.94	

Form IVP-1000, July 1999

Supervisory Review:

H. Smiljan

Print Name

Signature

[Signature]

Date

11-30-99

File Index Number

475

INDEPENDENT VERIFICATION SURVEY DATA SHEET

Survey Location: RFETS, 779 Cluster / Building Survey Unit: 779-35 Date: 11-30-99

Instrument Model Number: Eberline, E 600 Instrument ID Number: _____ Calibration Expires: _____

Detector Probe Type: Eberline, HP-100 Operator Name: A. Samilwan Signature: A. Samilwan

Sample Location / or Sample ID (AUX or record BAR Code #)	Time	Sample or Measurement Type	HP-100A Probe ID Number	Static Count Time	GROSS Measurement Reading (cpm/0.001cc)	Comments (Include description of surface characteristics and media composition, as applicable)
1VP0000 297	1552	Direct Static Measurement		1.5 Minute	13.79	Post Media Sampling
↓ 298	1556	Direct Static Measurement		1.5 Minute	16.99	↓
↓ 299	1558	Direct Static Measurement		1.5 Minute	13.78	↓
		Direct Static Measurement		1.5 Minute		
		Direct Static Measurement		1.5 Minute		
		Direct Static Measurement		1.5 Minute		
		Direct Static Measurement		1.5 Minute		
		Direct Static Measurement		1.5 Minute		

*nothing follows
AKC*

Form IVP-1000, July 1999

Supervisory Review: A. Samilwan , A. Samilwan , 11-30-99 File Index Number _____
 Print Name Signature Date

446

INDEPENDENT VERIFICATION SURVEY DATA SHEET

Survey Location: RFETS, 779 Cluster / Building Survey Unit: 779-35 Date: 11/22/99

Instrument Model Number: NA Instrument ID Number: NA Calibration Expires: NA

Detector Probe Type: NA Operator Name: JAY CAMERON Signature: Jay Cameron

Sample Location/ or Sample ID# (Affix or record Bar Code #)	Time	Sample or Measurement Type	HP-100 Probe ID Number	Static Count Time	GROSS Instrument Reading (cpm/100 cm)	Comments (Include description of surface characteristics and media composition, as applicable)
 SMR0000278	0959	Smear	NA	NA	NA	concrete ↓
 SMR0000279	1010	Smear	NA	NA	NA	
 SMR0000280	1012	Smear	NA	NA	NA	
 SMR0000281	1014	Smear	NA	NA	NA	
 SMR0000282	1330	Smear	NA	NA	NA	
 SMR0000283	1332	Smear	NA	NA	NA	
 SMR0000284	1334	Smear	NA	NA	NA	

Form IVP-1000, July 1999

Supervisory Review: A. Samiwan Signature: [Signature] Date: 11-24-99 File Index Number: _____

448 Print Name



INDEPENDENT VERIFICATION SURVEY DATA SHEET

Survey Location: RFETS, 779 Cluster / Building Survey Unit: 779-35 Date: 11/22/99 - 11/23/99
 Instrument Model Number: NA Instrument ID Number: NA Calibration Expires: NA
 Detector Probe Type: NA Operator Name: JAY CAMERON Signature: Jay Cameron

Sample Location of Sample ID: (Affix or record Bar Code #)	Time	Sample or Measurement Type	HP-100 Probe ID Number	Static Count Time	GROSS Instrument Reading (dpm/100 cm)	Comments (Include description of surface characteristics and media composition, as applicable)
 SMR0000285	1336	Smear	NA	NA	NA	concrete ↓
 SMR0000286	1338	Smear	NA	NA	NA	
 SMR0000287	1340	Smear	NA	NA	NA	
 SMR0000288	0930 11-23-99	Smear	NA	NA	NA	
 SMR0000289	0932	Smear	NA	NA	NA	
 SMR0000290	0934	Smear	NA	NA	NA	
 SMR0000291	0940	Smear	NA	NA	NA	

Form IVP-1000, July 1999

Supervisory Review: A. Sam. Khan Signature: A. Sam. Khan Date: 11-24-99 File Index Number: _____
 449 Print Name Signature Date

INDEPENDENT VERIFICATION SURVEY DATA SHEET

Survey Location: REETS, 779 Cluster / Building Survey Unit: 779-35 Date: 11/23/99

Instrument Model Number: NA Instrument ID Number: NA Calibration Expires: NA

Detector Probe Type: NA Operator Name: JAY CAMERON Signature: Jay Cameron

Sample Location or Sample ID # (Affix or record Bar Code #)	Time of Measurement	Sample or Measurement Type	HP-100 Probe ID Number	Static Count Time	GROSS Instrument Reading (dpm/100-cm)	Comments (Include description of surface characteristics and media composition, as applicable)
 SMR0000292	0942	Smear	NA	NA	NA	concrete
 SMR0000293	0944	Smear	NA	NA	NA	
 SMR0000294	0946	Smear	NA	NA	NA	
 SMR0000295	0948	Smear	NA	NA	NA	
 SMR0000296	0950	Smear	NA	NA	NA	
 SMR0000297	0952	Smear	NA	NA	NA	
 SMR0000298	0954	Smear	NA	NA	NA	

Form IVP-1000, July 1999

Supervisory Review: A. Sam... 11-24-99 File Index Number: _____
 Signature: _____ Date: _____

Print Name

Signature

Date

INDEPENDENT VERIFICATION SURVEY DATA SHEET

Survey Location: RFETS, 779 Cluster / Building Survey Unit: 979-35 Date: 11/23/99
 Instrument Model Number: NA Instrument ID Number: NA Calibration Expires: NA
 Detector Probe Type: NA Operator Name: JAY CAMERON Signature: Jay Cameron

Sample Location / of Sample ID (Affix or record Bar Code #)	Time	Sample or Measurement Type	RP-100 Probe ID Number	Static Count Time	GROSS Instrument Reading (dpm/100 cm)	Comments (Include description of surface characteristics and media composition, as applicable)
 SMR0000299	0956	Smear	NA	NA	NA	concrete
		Smear	NA	NA	NA	<i>AP nothing follows</i>
		Smear	NA	NA	NA	
		Smear	NA	NA	NA	
		Smear	NA	NA	NA	
		Smear	NA	NA	NA	
		Smear	NA	NA	NA	
		Smear	NA	NA	NA	

Form IVP-1000, July 1999

Supervisory Review: A. Sanni Isani , A. Sanni Isani , 11-24-99 File Index Number _____
 451 Print Name Signature Date

Survey Location: RFETS, 779 Cluster / Building Survey Unit: 779-35 Date: 11-29-99
 Instrument Model Number: NA Instrument ID Number: NA Calibration Expires: NA
 Detector Probe Type: NA Operator Name: A. Sami/Jan Signature: A. Sami/Jan

Sample Location# or Sample ID# (Affix or record Bar Code #)	Time	Sample or Measurement Type	HP-100 Probe ID Number	Static Count Time	GROSS Instrument Reading (dpm/100cm)	Comments (Include description of surface characteristics and media composition, as applicable)
 MED0000275	1225	Surface Media Sample	NA	NA	NA	<i>concrete surface that did not meet criteria for media sampling.</i>
 MED0000276	1235	Surface Media Sample	NA	NA	NA	
 MED0000277	1245	Surface Media Sample	NA	NA	NA	
 MED0000278	1250	Surface Media Sample	NA	NA	NA	
 MED0000279	1255	Surface Media Sample	NA	NA	NA	
 MED0000281	1310	Surface Media Sample	NA	NA	NA	
 MED0000282	1320	Surface Media Sample	NA	NA	NA	

Form IVP-1000, July 1999

Supervisory Review: A. Sami/Jan , A. Sami/Jan , 11-29-99 File Index Number _____
 452 Print Name Signature Date

INDEPENDENT VERIFICATION SURVEY DATA SHEET

Survey Location: RFETS, 779 Cluster / Building Survey Unit: 779-35 Date: 11-29-99
 Instrument Model Number: NA Instrument ID Number: NA Calibration Expires: NA
 Detector Probe Type: NA Operator Name: A. Samiljan Signature: A. Samiljan

Sample Location# or Sample ID# (Affix for record Bar Code #)	Time	Sample or Measurement Type	HP-100 Probe ID Number	Static Count Time	GROSS Instrument Reading (dpm/100 cm)	Comments (Include description of surface characteristics and media composition, as applicable)
 MED0000283	1325	Surface Media Sample	NA	NA	NA	<i>Concrete surface that did not meet criteria for media sampling.</i>
 MED0000284	1335	Surface Media Sample	NA	NA	NA	
 MED0000285	1340	Surface Media Sample	NA	NA	NA	
 MED0000286	1345	Surface Media Sample	NA	NA	NA	
 MED0000287	1400	Surface Media Sample	NA	NA	NA	
 MED0000288	1410	Surface Media Sample	NA	NA	NA	
 MED0000289	1415	Surface Media Sample	NA	NA	NA	

Form IVP-1000, July 1999

Supervisory Review: A. Samiljan A. Samiljan 11-29-99 File Index Number 453
 Print Name Signature Date

INDEPENDENT VERIFICATION SURVEY DATA SHEET

Survey Location: RFETS, 779 Cluster / Building Survey Unit: 779-35 Date: 11-29-99
 Instrument Model Number: NA Instrument ID Number: NA Calibration Expires: NA
 Detector Probe Type: NA Operator Name: A. Sam. IDAW Signature: A. Sam. IDAW

Sample Location# or Sample ID# (Affix or record Bar Code #)	Time	Sample or Measurement Type	HP-100 Probe ID Number	Static Count Time	GROSS Instrument Reading (dpm/100 cm)	Comments (Include description of surface characteristics and media composition, as applicable)
 MED0000290	1425	Surface Media Sample	NA	NA	NA	<i>concrete surface that did not meet criteria for media sampling</i>
 MED0000291	1430	Surface Media Sample	NA	NA	NA	
 MED0000292	1440	Surface Media Sample	NA	NA	NA	
 MED0000293	1450	Surface Media Sample	NA	NA	NA	
 MED0000294	1455	Surface Media Sample	NA	NA	NA	
 MED0000295	1505	Surface Media Sample	NA	NA	NA	
 MED0000296	1515	Surface Media Sample	NA	NA	NA	

Form IVP-1000, July 1999

Supervisory Review: A. Sam. IDAW , A. Sam. IDAW , 11-29-99 File Index Number _____
 Print Name Signature Date

454

INDEPENDENT VERIFICATION SURVEY DATA SHEET

Survey Location: RFETS, 779 Cluster / Building Survey Unit: 779-35 Date: 11-29-99
 Instrument Model Number: NA Instrument ID Number: NA Calibration Expires: NA
 Detector Probe Type: NA Operator Name: A. SAMILTAJAN Signature: [Signature]

Sample Location# or Sample ID# (Affix or record Bar Code #)	Time	Sample or Measurement Type	HP-100 Probe ID Number	Static Count Time	GROSS Instrument Reading (dpm/100 cm)	Comments (Include description of surface characteristics and media composition as applicable)
 MED0000297	1525	Surface Media Sample	NA	NA	NA	<i>concrete surface that did not meet criteria for media sampling</i> ↓
 MED0000298	1530	Surface Media Sample	NA	NA	NA	
 MED0000299	1540	Surface Media Sample	NA	NA	NA	
		Surface Media Sample	NA	NA	NA	<i>nothing follows</i>
		Surface Media Sample	NA	NA	NA	
		Surface Media Sample	NA	NA	NA	
		Surface Media Sample	NA	NA	NA	
		Surface Media Sample	NA	NA	NA	

Form IVP-1000, July 1999

Supervisory Review: A. SAMILTAJAN [Signature] 11-29-99 File Index Number _____
 Print Name Signature Date

455



Appendix E
Background Data Set

Background Data, Main Building, Survey Unit 779-35

Sample Location	Date	Time	E600 Serial #	Probe Serial #	Instrument Operating Mode	Channel Selected	Background Compensation Mode	Recorded Value	Units	Instrument Efficiency	Instrument raw count rate (cpm)
BACKGROUND	11/22/99	10:29:00	321	140	Scaler	Alpha	Gross	12.40	dpm/100cm ²	0.2076	2.6
BACKGROUND	11/22/99	10:31:00	321	140	Scaler	Alpha	Gross	20.70	dpm/100cm ²	0.2076	4.3
BACKGROUND	11/22/99	10:33:00	321	140	Scaler	Alpha	Gross	16.60	dpm/100cm ²	0.2076	3.4
BACKGROUND	11/22/99	11:42:00	321	140	Scaler	Alpha	Gross	12.40	dpm/100cm ²	0.2076	2.6
BACKGROUND	11/22/99	11:43:00	321	140	Scaler	Alpha	Gross	12.40	dpm/100cm ²	0.2076	2.6
BACKGROUND	11/22/99	11:47:00	321	140	Scaler	Alpha	Gross	4.14	dpm/100cm ²	0.2076	0.9
BACKGROUND	11/22/99	14:14:00	321	140	Scaler	Alpha	Gross	24.80	dpm/100cm ²	0.2076	5.1
BACKGROUND	11/22/99	14:16:00	321	140	Scaler	Alpha	Gross	20.70	dpm/100cm ²	0.2076	4.3
BACKGROUND	11/22/99	14:19:00	321	140	Scaler	Alpha	Gross	12.40	dpm/100cm ²	0.2076	2.6
BACKGROUND	11/22/99	15:19:00	321	140	Scaler	Alpha	Gross	24.80	dpm/100cm ²	0.2076	5.1
BACKGROUND	11/22/99	15:21:00	321	140	Scaler	Alpha	Gross	24.80	dpm/100cm ²	0.2076	5.1
BACKGROUND	11/22/99	15:24:00	321	140	Scaler	Alpha	Gross	16.60	dpm/100cm ²	0.2076	3.4
BACKGROUND	11/23/99	10:38:00	321	109	Scaler	Alpha	Gross	11.00	dpm/100cm ²	0.1949	2.1
BACKGROUND	11/23/99	10:39:00	321	109	Scaler	Alpha	Gross	14.20	dpm/100cm ²	0.1949	2.8
BACKGROUND	11/23/99	10:43:00	321	109	Scaler	Alpha	Gross	14.40	dpm/100cm ²	0.1949	2.8
BACKGROUND	11/23/99	11:48:00	321	109	Scaler	Alpha	Gross	4.28	dpm/100cm ²	0.1949	0.8
BACKGROUND	11/23/99	11:49:00	321	109	Scaler	Alpha	Gross	17.70	dpm/100cm ²	0.1949	3.4
BACKGROUND	11/23/99	11:51:00	321	109	Scaler	Alpha	Gross	10.80	dpm/100cm ²	0.1949	2.1
BACKGROUND	11/23/99	12:25:00	321	109	Scaler	Alpha	Gross	17.90	dpm/100cm ²	0.1949	3.5
BACKGROUND	11/23/99	12:26:00	321	109	Scaler	Alpha	Gross	18.00	dpm/100cm ²	0.1949	3.5
BACKGROUND	11/23/99	12:28:00	321	109	Scaler	Alpha	Gross	14.60	dpm/100cm ²	0.1949	2.8
BACKGROUND	11/30/99	14:31:00	321	109	Scaler	Alpha	Gross	18.00	dpm/100cm ²	0.1949	3.5
BACKGROUND	11/30/99	14:32:00	321	109	Scaler	Alpha	Gross	11.10	dpm/100cm ²	0.1949	2.2
BACKGROUND	11/30/99	14:34:00	321	109	Scaler	Alpha	Gross	11.10	dpm/100cm ²	0.1949	2.2
BACKGROUND	11/30/99	15:43:00	321	109	Scaler	Alpha	Gross	21.40	dpm/100cm ²	0.1949	4.2
BACKGROUND	11/30/99	15:47:00	321	109	Scaler	Alpha	Gross	14.20	dpm/100cm ²	0.1949	2.8
BACKGROUND	11/30/99	15:49:00	321	109	Scaler	Alpha	Gross	14.50	dpm/100cm ²	0.1949	2.8
BACKGROUND	11/30/99	17:10:00	321	109	Scaler	Alpha	Gross	11.60	dpm/100cm ²	0.1949	2.3
BACKGROUND	11/30/99	17:11:00	321	109	Scaler	Alpha	Gross	11.50	dpm/100cm ²	0.1949	2.2
BACKGROUND	11/30/99	17:15:00	321	109	Scaler	Alpha	Gross	15.00	dpm/100cm ²	0.1949	2.9

Summary Statistics

Number of Measurements	30
Mean	15.1
Log Normal Mean	14.098078
Median	14.5
Std. Deviation	5.1933622
CV	0.3431586

Response Data, Main Building, Survey Unit 779-35

Sample Location	Date	Time	E600 Serial #	Probe Serial #	Instrument Operating Mode	Channel Selected	Background Compensation Mode	Recorded Value	Units
RESP/CHECK	11/22/99	10:35:00	321	140	Scaler	Alpha	Gross	1620.00	dpm/100cm ²
RESP/CHECK	11/22/99	10:36:00	321	140	Scaler	Alpha	Gross	1810.00	dpm/100cm ²
RESP/CHECK	11/22/99	10:38:00	321	140	Scaler	Alpha	Gross	1660.00	dpm/100cm ²
RESP/CHECK	11/22/99	12:01:00	321	140	Scaler	Alpha	Gross	1760.00	dpm/100cm ²
RESP/CHECK	11/22/99	12:03:00	321	140	Scaler	Alpha	Gross	1790.00	dpm/100cm ²
RESP/CHECK	11/22/99	12:05:00	321	140	Scaler	Alpha	Gross	1920.00	dpm/100cm ²
RESP/CHECK	11/22/99	14:25:00	321	140	Scaler	Alpha	Gross	1740.00	dpm/100cm ²
RESP/CHECK	11/22/99	14:27:00	321	140	Scaler	Alpha	Gross	1860.00	dpm/100cm ²
RESP/CHECK	11/22/99	14:29:00	321	140	Scaler	Alpha	Gross	1820.00	dpm/100cm ²
RESP/CHECK	11/22/99	15:12:00	321	140	Scaler	Alpha	Gross	1660.00	dpm/100cm ²
RESP/CHECK	11/22/99	15:13:00	321	140	Scaler	Alpha	Gross	1910.00	dpm/100cm ²
RESP/CHECK	11/22/99	15:15:00	321	140	Scaler	Alpha	Gross	1829.00	dpm/100cm ²
RESP/CHECK	11/23/99	10:32:00	321	109	Scaler	Alpha	Gross	1540.00	dpm/100cm ²
RESP/CHECK	11/23/99	10:34:00	321	109	Scaler	Alpha	Gross	1460.00	dpm/100cm ²
RESP/CHECK	11/23/99	10:35:00	321	109	Scaler	Alpha	Gross	1490.00	dpm/100cm ²
RESP/CHECK	11/23/99	11:42:00	321	109	Scaler	Alpha	Gross	1500.00	dpm/100cm ²
RESP/CHECK	11/23/99	11:44:00	321	109	Scaler	Alpha	Gross	1410.00	dpm/100cm ²
RESP/CHECK	11/23/99	11:45:00	321	109	Scaler	Alpha	Gross	1500.00	dpm/100cm ²
RESP/CHECK	11/23/99	12:19:00	321	109	Scaler	Alpha	Gross	1530.00	dpm/100cm ²
RESP/CHECK	11/23/99	12:21:00	321	109	Scaler	Alpha	Gross	1370.00	dpm/100cm ²
RESP/CHECK	11/23/99	12:23:00	321	109	Scaler	Alpha	Gross	1410.00	dpm/100cm ²
RESP/CHECK	11/30/99	14:25:00	321	109	Scaler	Alpha	Gross	1500.00	dpm/100cm ²
RESP/CHECK	11/30/99	14:27:00	321	109	Scaler	Alpha	Gross	1500.00	dpm/100cm ²
RESP/CHECK	11/30/99	14:29:00	321	109	Scaler	Alpha	Gross	1520.00	dpm/100cm ²
RESP/CHECK	11/30/99	15:37:00	321	109	Scaler	Alpha	Gross	1490.00	dpm/100cm ²
RESP/CHECK	11/30/99	15:39:00	321	109	Scaler	Alpha	Gross	1430.00	dpm/100cm ²
RESP/CHECK	11/30/99	15:41:00	321	109	Scaler	Alpha	Gross	1490.00	dpm/100cm ²
RESP/CHECK	11/30/99	17:00:00	321	109	Scaler	Alpha	Gross	1380.00	dpm/100cm ²
RESP/CHECK	11/30/99	17:02:00	321	109	Scaler	Alpha	Gross	1350.00	dpm/100cm ²
RESP/CHECK	11/30/99	17:06:00	321	109	Scaler	Alpha	Gross	1410.00	dpm/100cm ²

Probe #	Response	-20%	20%
140	1599	1279	1919
109	1631	1305	1957

Direct Static Surface Contamination Measurements, Main Building, Survey Unit 779-35

Sample Location	Date	Time	E600 Serial #	Probe Serial #	Instrument Operating Mode	Channel Selected	Background Compensation Mode	Recorded Value	Units	Instrument Efficiency	Instrument raw count rate (cpm)	Count Time (seconds)
IVP0000271	11/22/99	10:42:00	321	140	Scaler	Alpha	Gross	8.28	dpm/100cm ²	0.2076	1.7	90
IVP0000272	11/22/99	10:44:00	321	140	Scaler	Alpha	Gross	16.60	dpm/100cm ²	0.2076	3.4	90
IVP0000273	11/22/99	10:49:00	321	140	Scaler	Alpha	Gross	16.60	dpm/100cm ²	0.2076	3.4	90
IVP0000274	11/22/99	10:54:00	321	140	Scaler	Alpha	Gross	12.40	dpm/100cm ²	0.2076	2.6	90
IVP0000275	11/22/99	10:57:00	321	140	Scaler	Alpha	Gross	16.60	dpm/100cm ²	0.2076	3.4	90
IVP0000276	11/22/99	11:01:00	321	140	Scaler	Alpha	Gross	4.14	dpm/100cm ²	0.2076	1.7	90
IVP0000277	11/22/99	11:10:00	321	140	Scaler	Alpha	Gross	4.14	dpm/100cm ²	0.2076	0.9	90
IVP0000278	11/22/99	11:15:00	321	140	Scaler	Alpha	Gross	16.60	dpm/100cm ²	0.2076	3.4	90
IVP0000279	11/22/99	11:29:00	321	140	Scaler	Alpha	Gross	16.60	dpm/100cm ²	0.2076	3.4	90
IVP0000280	11/22/99	11:35:00	321	140	Scaler	Alpha	Gross	4.14	dpm/100cm ²	0.2076	0.9	90
IVP0000281	11/22/99	11:37:00	321	140	Scaler	Alpha	Gross	4.14	dpm/100cm ²	0.2076	0.9	90
IVP0000282	11/22/99	14:39:00	321	140	Scaler	Alpha	Gross	4.14	dpm/100cm ²	0.2076	2.6	90
IVP0000283	11/22/99	14:58:00	321	140	Scaler	Alpha	Gross	4.14	dpm/100cm ²	0.2076	0.9	90
IVP0000284	11/23/99	10:47:00	321	109	Scaler	Alpha	Gross	7.38	dpm/100cm ²	0.1947	1.4	90
IVP0000285	11/23/99	10:50:00	321	109	Scaler	Alpha	Gross	20.00	dpm/100cm ²	0.1947	3.9	90
IVP0000286	11/23/99	10:53:00	321	109	Scaler	Alpha	Gross	13.20	dpm/100cm ²	0.1947	2.6	90
IVP0000287	11/23/99	10:59:00	321	109	Scaler	Alpha	Gross	20.50	dpm/100cm ²	0.1947	4.0	90
IVP0000288	11/23/99	11:03:00	321	109	Scaler	Alpha	Gross	16.80	dpm/100cm ²	0.1947	1.6	90
IVP0000289	11/23/99	11:15:00	321	109	Scaler	Alpha	Gross	16.80	dpm/100cm ²	0.1947	3.3	90
IVP0000290	11/23/99	11:18:00	321	109	Scaler	Alpha	Gross	13.40	dpm/100cm ²	0.1947	2.6	90
IVP0000291	11/23/99	11:22:00	321	109	Scaler	Alpha	Gross	13.20	dpm/100cm ²	0.1947	2.6	90
IVP0000292	11/23/99	11:25:00	321	109	Scaler	Alpha	Gross	16.60	dpm/100cm ²	0.1947	3.2	90
IVP0000293	11/23/99	11:28:00	321	109	Scaler	Alpha	Gross	16.40	dpm/100cm ²	0.1947	3.2	90
IVP0000294	11/23/99	11:33:00	321	109	Scaler	Alpha	Gross	20.30	dpm/100cm ²	0.1947	3.6	90
IVP0000295	11/23/99	11:55:00	321	109	Scaler	Alpha	Gross	20.30	dpm/100cm ²	0.1947	4.0	90
IVP0000296	11/23/99	11:58:00	321	109	Scaler	Alpha	Gross	6.17	dpm/100cm ²	0.1947	1.2	90
IVP0000297	11/23/99	12:03:00	321	109	Scaler	Alpha	Gross	9.92	dpm/100cm ²	0.1947	1.9	90
IVP0000298	11/23/99	12:09:00	321	109	Scaler	Alpha	Gross	13.20	dpm/100cm ²	0.1947	2.6	90
IVP0000299	11/23/99	12:13:00	321	109	Scaler	Alpha	Gross	13.20	dpm/100cm ²	0.1947	2.6	90

IVP0000300 (blacked out)

Post Surface Media Sampling Direct Static Surface Measurements, Main Building, Survey Unit 779-35

Sample Location	Date	Time	E600 Serial #	Probe Serial #	Instrument Operating Mode	Channel Selected	Background Compensation Mode	Recorded Value	Units	Instrument Efficiency	Instrument raw count rate (cpm)	Count Time (seconds)
IVP0000275	11/30/99	14:39:00	321	109	Scaler	Alpha	Gross	10.40	dpm/100cm ²	0.1947	2.0	90
IVP0000276	11/30/99	14:41:00	321	109	Scaler	Alpha	Gross	13.60	dpm/100cm ²	0.1947	2.6	90
IVP0000277	11/30/99	14:44:00	321	109	Scaler	Alpha	Gross	7.12	dpm/100cm ²	0.1947	1.4	90
IVP0000278	11/30/99	14:46:00	321	109	Scaler	Alpha	Gross	6.48	dpm/100cm ²	0.1947	1.3	90
IVP0000279	11/30/99	14:57:00	321	109	Scaler	Alpha	Gross	23.60	dpm/100cm ²	0.1947	4.6	90
IVP0000281	11/30/99	15:00:00	321	109	Scaler	Alpha	Gross	6.69	dpm/100cm ²	0.1947	1.3	90
IVP0000282	11/30/99	15:21:00	321	109	Scaler	Alpha	Gross	13.20	dpm/100cm ²	0.1947	2.6	90
IVP0000283	11/30/99	15:25:00	321	109	Scaler	Alpha	Gross	14.00	dpm/100cm ²	0.1947	2.7	90
IVP0000284	11/30/99	15:27:00	321	109	Scaler	Alpha	Gross	10.60	dpm/100cm ²	0.1947	2.1	90
IVP0000285	11/30/99	15:31:00	321	109	Scaler	Alpha	Gross	9.77	dpm/100cm ²	0.1947	1.9	90
IVP0000286	11/30/99	15:33:00	321	109	Scaler	Alpha	Gross	9.81	dpm/100cm ²	0.1947	1.9	90
IVP0000287	11/30/99	15:58:00	321	109	Scaler	Alpha	Gross	6.88	dpm/100cm ²	0.1947	1.3	90
IVP0000288	11/30/99	16:03:00	321	109	Scaler	Alpha	Gross	7.00	dpm/100cm ²	0.1947	1.4	90
IVP0000289	11/30/99	16:13:00	321	109	Scaler	Alpha	Gross	16.90	dpm/100cm ²	0.1947	3.3	90
IVP0000290	11/30/99	16:16:00	321	109	Scaler	Alpha	Gross	3.47	dpm/100cm ²	0.1947	0.7	90
IVP0000291	11/30/99	16:21:00	321	109	Scaler	Alpha	Gross	17.00	dpm/100cm ²	0.1947	3.3	90
IVP0000292	11/30/99	16:24:00	321	109	Scaler	Alpha	Gross	23.90	dpm/100cm ²	0.1947	4.7	90
IVP0000293	11/30/99	16:28:00	321	109	Scaler	Alpha	Gross	20.50	dpm/100cm ²	0.1947	4.0	90
IVP0000294	11/30/99	16:38:00	321	109	Scaler	Alpha	Gross	7.11	dpm/100cm ²	0.1947	1.4	90
IVP0000295	11/30/99	16:40:00	321	109	Scaler	Alpha	Gross	17.30	dpm/100cm ²	0.1947	3.4	90
IVP0000296	11/30/99	16:45:00	321	109	Scaler	Alpha	Gross	23.90	dpm/100cm ²	0.1947	4.7	90
IVP0000297	11/30/99	16:48:00	321	109	Scaler	Alpha	Gross	13.80	dpm/100cm ²	0.1947	2.7	90
IVP0000298	11/30/99	16:52:00	321	109	Scaler	Alpha	Gross	17.00	dpm/100cm ²	0.1947	3.3	90
IVP0000299	11/30/99	16:56:00	321	109	Scaler	Alpha	Gross	13.80	dpm/100cm ²	0.1947	2.7	90

460

Surface Media Sample Data, Main Building, Survey Unit 779-35
Alpha Isotopic Analysis

Sample Location	SampleID #	Lab Sample ID #	Sample Weight (grams)	Date Collected MM/DD/YY	Time Collected	Units	Am-241		Pu-238		Pu-239/240		U-234	U-235		U-238	Total Transuranic Activity	Total Uranium Activity
							Reported Value	Reported Value w/samples < MDA at 0.5 MDA	Reported Value	Reported Value w/samples < MDA at 0.5 MDA	Reported Value	Reported Value w/samples < MDA at 0.5 MDA	Reported Value	Value	Reported Value w/samples < MDA at 0.5 MDA	Reported Value	dpm/100 cm ²	dpm/100 cm ²
IVP0000275	MED0000275	263921	12.71	11/29/99	12:25	dpm/100 cm ²	2.34	2.34	0.35	0.18	11.97	11.97	22.39	1.64	1.64	23.25	14.49	47.28
IVP0000276	MED0000276	263922	10.86	11/29/99	12:35	dpm/100 cm ²	2.99	2.99	2.24	2.24	128.90	128.90	16.66	0.95	0.48	16.19	134.13	33.33
IVP0000277	MED0000277	263923	11.91	11/29/99	12:45	dpm/100 cm ²	0.91	0.91	1.10	0.55	2.10	2.10	15.91	1.30	0.65	21.74	3.56	38.30
IVP0000278	MED0000278	263924	15.61	11/29/99	12:50	dpm/100 cm ²	9.01	9.01	0.79	0.40	10.23	10.23	20.12	2.27	2.27	19.55	19.64	41.94
IVP0000279	MED0000279	263925	16.39	11/29/99	12:55	dpm/100 cm ²	1.92	1.92	2.59	2.59	2.07	2.07	32.12	1.69	0.85	31.87	6.58	64.84
IVP0000281	MED0000281	263926	10.12	11/29/99	13:10	dpm/100 cm ²	0.92	0.46	0.24	0.12	0.88	0.44	18.00	1.04	0.52	21.56	1.02	40.08
IVP0000282	MED0000282	263927	9.09	11/29/99	13:20	dpm/100 cm ²	0.55	0.28	0.52	0.26	1.33	1.33	19.08	1.40	1.40	17.37	1.87	37.85
IVP0000283	MED0000283	263928	14.15	11/29/99	13:25	dpm/100 cm ²	1.05	0.53	0.87	0.34	2.30	2.30	41.22	3.52	3.52	41.56	3.16	86.30
IVP0000284	MED0000284	263929	17.57	11/29/99	13:35	dpm/100 cm ²	1.15	1.15	1.21	0.61	1.46	1.46	39.00	2.15	1.08	36.69	3.22	76.77
IVP0000285	MED0000285	263930	10.25	11/29/99	13:40	dpm/100 cm ²	0.81	0.81	0.82	0.46	0.52	0.26	17.96	1.16	0.58	19.59	1.53	38.13
IVP0000286	MED0000286	263931	7.93	11/29/99	13:45	dpm/100 cm ²	0.63	0.32	0.39	0.20	0.48	0.24	16.82	1.19	1.19	19.29	0.75	37.30
IVP0000287	MED0000287	263932	17.89	11/29/99	14:00	dpm/100 cm ²	0.74	0.74	0.91	0.46	1.80	0.80	31.94	1.76	1.76	28.78	2.00	62.48
IVP0000288	MED0000288	263933	11.97	11/29/99	14:10	dpm/100 cm ²	0.57	0.29	0.60	0.30	0.82	0.41	23.60	1.08	0.54	26.39	1.00	50.53
IVP0000289	MED0000289	263934	12.80	11/29/99	14:15	dpm/100 cm ²	0.85	0.85	0.34	0.17	0.70	0.35	22.54	1.39	1.39	23.68	1.37	47.61
IVP0000290	MED0000290	263935	15.26	11/29/99	14:25	dpm/100 cm ²	0.98	0.98	0.86	0.43	1.31	0.66	25.66	1.98	1.98	28	2.07	55.64
IVP0000291	MED0000291	263936	11.03	11/29/99	14:30	dpm/100 cm ²	0.73	0.37	1.00	0.50	1.00	0.50	21.67	1.20	0.60	22.31	1.37	44.58
IVP0000292	MED0000292	263937	12.85	11/29/99	14:40	dpm/100 cm ²	0.76	0.38	0.56	0.28	0.92	0.46	27.20	1.35	0.68	28.41	1.12	56.29
IVP0000293	MED0000293	263938	7.87	11/29/99	14:50	dpm/100 cm ²	0.66	0.66	0.46	0.23	0.18	0.18	13.64	1.28	1.28	14.55	1.07	29.47
IVP0000294	MED0000294	263939	10.84	11/29/99	14:55	dpm/100 cm ²	0.66	0.66	0.54	0.27	0.89	0.50	20.87	1.90	0.95	20.04	1.43	41.86
IVP0000295	MED0000295	263940	7.49	11/29/99	15:05	dpm/100 cm ²	0.59	0.59	0.38	0.19	0.58	0.29	17.77	0.97	0.97	15.74	1.07	34.48
IVP0000296	MED0000296	263941	13.29	11/29/99	15:15	dpm/100 cm ²	0.56	0.56	0.74	0.37	0.92	0.46	25.87	1.62	1.62	22.23	1.39	49.72
IVP0000297	MED0000297	263942	13.42	11/29/99	15:25	dpm/100 cm ²	0.56	0.56	0.90	0.45	0.99	0.50	21.37	1.81	0.91	22.32	1.51	44.60
IVP0000298	MED0000298	263943	9.55	11/29/99	15:30	dpm/100 cm ²	0.56	0.28	0.56	0.29	0.64	0.64	18.02	1.05	1.05	18.06	1.21	37.13
IVP0000299	MED0000299	263944	15.43	11/29/99	15:40	dpm/100 cm ²	1.23	0.82	0.88	0.44	1.21	0.61	34.28	1.87	0.94	32.61	1.66	67.83

Appendix F
Duplicate Sample Data

Cross Reference Table for Blank and Spiked Samples for Survey Units 779-35

Sample Location	Sample Ticket Number (IVC)	Date Transferred	Smear Number
IVP0000597	259768	11/29/99	SMR0000597
IVP0000598	259733	11/29/99	SMR0000598
IVP0000599	259734	11/29/99	SMR0000599

Appendix G

Instrument Calibration Data

Data Set Sheet

Mo

SHP100 Property Number \$16338 Serial Number 140

Eberline E600 Property Number \$15622 Serial Number 321

2.2 Calibration Source

Isotope/ Source	Source Serial No.	Certified Activity (dpm)	Observed Activity (dpm)	% Difference	Efficiency cpm/dpm	SOURCE GEOMETRY
Am-241 SR-90	CSL 60417	16,600	N/A	N/A	.3524	37mm disc
Pu-239 Pu-239	GM-785	1604 dpm/100cm ²	1605 dpm/ 100cm ²	0.06%	.2076	150 cm ² PLANE

4.9 Record the alpha background count rate (< 5 cpm) 2.2 cpm

4.12 Record the beta background count rate (< 600 cpm) 267 cpm

4.14 Record the beta efficiency (cpm/dpm) in the cell marked "4.14" in the right hand column of the above table.

4.18 Decrease in beta efficiency after 4 hours N/A % SEE NOTE #1

4.19 GEOMETRY - DETECTOR CENTERED OVER SOURCE, PROBE FACE @ $\approx 3/16$ "

5. Completion

Service Request No. N/A PASSED FAILED

(Reason) PROBE CALIBRATION FOR USE @ RFETS, INC SURVEYS

LIMITED
6. Calibration Sticker and Interval

New Sticker Attached Due Date 6/30/2000

This calibration complies the requirements of ANSI 323-1978 and 10 CFR 835, and has been calibrated using standards whose accuracy is traceable to the National Institute of Standards and Technology.

Signature JW LIVERY Date 6/30/99

#1 THIS IS PERFORMED as part of the field Q.C. of the HP-100 probe when response checks are performed for the probes \approx every hour during field use. Experience shows that probe efficiency (α) does not degrade more than 20% over the 2 hour period a probe is used. See attached graphs.

#2 Plateau Graph was not printed out for the record since no printer was available in the field. The selected high voltage (1592 vdc) result in $< 10\%$ $\beta \rightarrow \alpha$ crossover.

EBERLINE E-600 CALIBRATION REPORT

06/30/99 09:34:06

E-600 Serial Number : 321
Program Version : E600 V3.12
Calibration Date/Due Date : 03/23/99 to 03/23/00
Scaler Precision : 10 μ
Lower Threshold Slope : 0.9524
Lower Threshold Intercept : -0.1429 mV
Upper Threshold Slope : 1.02
Upper Threshold Intercept : -0.6074 mV
Alarm Editing : Enabled
Latching Alarms : Enabled
Auto Ranging : Disabled
Beep on Auto-Range : No
Ignore E-600 Cal. Date : No
Ignore Probe Cal. Date : No
Ratemeter Mode Support : Enabled
Integrate Mode Support : Enabled
Scaler Mode Support : Enabled
Peak Hold Mode Support : Enabled
Background Update Mode Support : Enabled
Log ID Source : Internal/Aux.
Star Key Ratemeter Function : Zero Display
Star Key Integrate Function : Zero Display
Scaler Display Units : Rate
Scaler Counting Mode : Fixed Time

Smart Probe Serial Number : 140
Type : HP-100
Calibration Date/Due Date : 06/30/99 to 06/30/00
Dead Time : 7.50 usec
Surface Area : 100 cm²
Max High Voltage : 1900 Vdc
Overrange : 80000 cps

Data Set Sheet

SHP100 Property Number \$15564 Serial Number 109

Eberline E600 Property Number \$15622 Serial Number 321

2.2 Calibration Source

Isotope/ Source	Source Serial No.	Certified Activity (dpm)	Observed Activity (dpm)	% Difference	Efficiency cpm/dpm	SOURCE GEOMETRY
Cl-36 SR-90	CSL#604177	16,600	N/A	N/A	.3838	37 mm disc
Pu-239 Pu-239	GM-785	1604 dpm/100cm ²	1684 dpm/ 100cm ²	4.99%	.1949	150cm ² PLANE

4.9 Record the alpha background count rate (< 5 cpm) 2.4 cpm

4.12 Record the beta background count rate (< 600 cpm) 243 cpm

4.14 Record the beta efficiency (cpm/dpm) in the cell marked "4.14" in the right hand column of the above table.

4.18 Decrease in beta efficiency after 4 hours N/A % SEE NOTE #1

4.19 GEOMETRY - DETECTOR CENTERED OVER SOURCE, PROBE FACE @ $\approx 3/16$ "

5. Completion

Service Request No. N/A PASSED FAILED

(Reason) PROBE CALIBRATION FOR USE @ REETS, IVC SURVEYS

6. LIMITED Calibration Sticker and Interval

New Sticker Attached Due Date 6/30/2000

This calibration complies the requirements of ANSI 323-1978 and 10 CFR 835, and has been calibrated using standards whose accuracy is traceable to the National Institute of Standards and Technology.

Signature JW Lively Date 6/30/99

#1 THIS IS PERFORMED AS PART OF THE FIELD O.C. OF THE HP-100 PROBE WHERE RESPONSE CHECKS ARE PERFORMED FOR THE PROBES \approx EVERY HOUR DURING FIELD USE. EXPERIENCE SHOWS THAT PROBE EFFICIENCY (α) DOES NOT DEGRADE MORE THAN 20% OVER THE 2 HOUR PERIOD A PROBE IS USED. SEE ATTACHED GRAPHS.

#2 PLATEAU GRAPH WAS NOT PRINTED OUT FOR THE RECORD SINCE NO PRINTER WAS AVAILABLE IN THE FIELD. THE SELECTED HIGH VOLTAGE (1572 VDC) RESULTED IN $< 1\%$ $\beta \rightarrow \alpha$ CROSSOVER.

EBERLINE E-600 CALIBRATION REPORT

06/30/99 10:30:36

E-600 Serial Number : 321
Program Version : E600 V3.12
Calibration Date/Due Date : 03/23/99 to 03/23/00
Scaler Precision : 10%
Lower Threshold Slope : 0.9524
Lower Threshold Intercept : -0.1429 mV
Upper Threshold Slope : 1.02
Upper Threshold Intercept : -0.6074 mV
Alarm Editing : Enabled
Latching Alarms : Enabled
Auto Ranging : Disabled
Beep on Auto-Range : No
Ignore E-600 Cal. Date : No
Ignore Probe Cal. Date : No
Ratemeter Mode Support : Enabled
Integrate Mode Support : Enabled
Scaler Mode Support : Enabled
Peak Hold Mode Support : Enabled
Background Update Mode Support : Enabled
Log ID Source : Internal/Aux.
Star Key Ratemeter Function : Zero Display
Star Key Integrate Function : Zero Display
Scaler Display Units : Rate
Scaler Counting Mode : Fixed Time

Smart Probe Serial Number : 109
Type : HP-100
Calibration Date/Due Date : 06/30/99 to 06/30/00
Dead Time : 7.50 usec
Surface Area : 100 cm2
Max High Voltage : 1900 Vdc
Overrange : 80000 cps

Probe HP-100 109 continued...

Channel 1

Channel Type : Alpha
Rate Units : dpm/100cm2
Response Times : 22,10,3 secs
High Voltage : 1572 Vdc
Lower Threshold : 1.00 mV
Upper Threshold : 27.1 mV
Selected Window : Upper
Upper Cal. Constant : 0.1949 counts/disint.
Scaler Time : 90 secs
Lower to Upper Crossover : 0.0012
Upper to Lower Crossover : 0.0838

Channel 2

Channel Type : Beta
Rate Units : dpm/100cm2
Response Times : 22,10,3 secs
High Voltage : 1572 Vdc
Lower Threshold : 1.00 mV
Upper Threshold : 27.1 mV
Selected Window : Lower
Lower Cal. Constant : 0.3838 counts/disint.
Scaler Time : 90 secs
Lower to Upper Crossover : 0.0012
Upper to Lower Crossover : 0.0838

Channel 3

Channel Type : Alpha/Beta
Rate Units : dpm/100cm2
Response Times : 22,10,3 secs
High Voltage : 1572 Vdc
Lower Threshold : 1.00 mV
Upper Threshold : 27.1 mV
Selected Window : Both
Lower Cal. Constant : 0.3838 counts/disint.
Upper Cal. Constant : 0.1949 counts/disint.
Scaler Time : 90 secs
Lower to Upper Crossover : 0.0012
Upper to Lower Crossover : 0.0838

Cable Length: 60 inches

Signature: Jerry W. Ruff

Jerry W. Ruff

LIVELY

Date: 6/30/99

6/30/99

After-Calibration Source Response Check Data Sheet

Location Rock Flats 10C
 Month Aug Day 4 Year 1999

Detector/Probe Data (if applicable)
 Manufacturer EBERLING
 Model No. E-600/W SHP-100 #109
 Government Property No. \$ 15564
 Calibration Due Date 6-30-00

Survey Instrument Data

Manufacturer EBERLING
 Model No. E-600
 Government Property No. \$ 15622
 Calibration Due Date 3-23-00

Check Source Data

Isotope Pu-239
 Source I.D. No. Gm-785

Instrument Scale	Source Detector Distance	Shielding/Geometry	Instrument Response	-20%	+20%	Scale Units
NA	~ 1/8"	CONTACT w/ RUBBER FEET	1631	1305	1957	dpm/ 100 cm ²

Comments:

A. SAMILSAN
 Performed by (print)
J. LIVERY
 Reviewed by (print)

[Signature]
 Performed by (signature)
[Signature]
 Reviewed by (signature)
8/4/99
 Date
8/6/99
 Date

Probe HP-100 140 continued...

Channel 1

Channel Type : Alpha
Rate Units : dpm/100cm2
Response Times : 22,10,3 secs
High Voltage : 1592 Vdc
Lower Threshold : 1.00 mV
Upper Threshold : 27.1 mV
Selected Window : Upper
Upper Cal. Constant : 0.2076 counts/disint.
Scaler Time : 90 secs
Lower to Upper Crossover : 0.0
Upper to Lower Crossover : 1.12

Channel 2

Channel Type : Beta
Rate Units : dpm/100cm2
Response Times : 22,10,3 secs
High Voltage : 1592 Vdc
Lower Threshold : 1.00 mV
Upper Threshold : 27.1 mV
Selected Window : Lower
Lower Cal. Constant : 0.3524 counts/disint.
Scaler Time : 90 secs
Lower to Upper Crossover : 0.0
Upper to Lower Crossover : 1.12

Channel 3

Channel Type : Alpha/Beta
Rate Units : dpm/100cm2
Response Times : 22,10,3 secs
High Voltage : 1592 Vdc
Lower Threshold : 1.00 mV
Upper Threshold : 27.1 mV
Selected Window : Both
Lower Cal. Constant : 0.3524 counts/disint.
Upper Cal. Constant : 0.2076 counts/disint.
Scaler Time : 90 secs
Lower to Upper Crossover : 0.0
Upper to Lower Crossover : 1.12

Cable Length: 60 inches

Signature: Joseph W. Ruff

Date: 6/30/99

After-Calibration Source Response Check Data Sheet

Location ROCKY FLATS INC
 Month AUG Day 4 Year 1999

Detector/Probe Data (if applicable)
 Manufacturer EBERLINE
 Model No. E-600 / w SHP-100 # 140
 Government Property No. 516338
 Calibration Due Date 6/30/2000

Survey Instrument Data
 Manufacturer EBERLINE
 Model No. E600
 Government Property No. 515622
 Calibration Due Date 3/23/2000

Check Source Data
 Isotope Pu-239
 Source I.D. No. GM-785

Instrument Scale	Source Detector Distance	Shielding/Geometry	Instrument Response	-20%	+20%	Scale Units
N/A	≈ 1/8"	CONTACT w/ RUBBER FEET	1599	1279	1919	dpm/100cm ²

Comments:

A. SAMILIAN Performed by (print) A. Samilian Performed by (signature) 8/4/99 Date
J. LIVERY Reviewed by (print) JW [Signature] Reviewed by (signature) 8/6/99 Date

File Index No. _____

Appendix H

Raw Data

This appendix contains the raw ASCII text file data download directly from the E-600 instrument's memories without modification, sorting, or data reduction of any kind. The data are actually contained in three separate ASCII files, one file corresponding to each date in which information was collected. One unique aspect of this data presentation is that the data is presented exactly in the chronological order in which it was collected in the field. This provides an electronic time stamp permitting verification that time criteria included in the field operating procedures associated with the IV SAP were met.

"Survey Location", "Log Date", "Log Time", "Probe S/N", "Log Mode", "Channel Type", "Reading", "Gross/Net", "Units", "E-600
S/N", "E-600 Address", "Stored Bkg", "Bkg Units", "Status"

"RESP/CHECK", "11/30/99", "14:25:00", "109", "Scaler", "Alpha", 1.50E+03, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"
"RESP/CHECK", "11/30/99", "14:27:00", "109", "Scaler", "Alpha", 1.50E+03, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"
"RESP/CHECK", "11/30/99", "14:29:00", "109", "Scaler", "Alpha", 1.52E+03, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"
"BACKGROUND", "11/30/99", "14:31:00", "109", "Scaler", "Alpha", 1.80E+01, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"
"BACKGROUND", "11/30/99", "14:32:00", "109", "Scaler", "Alpha", 1.11E+01, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"
"BACKGROUND", "11/30/99", "14:34:00", "109", "Scaler", "Alpha", 1.11E+01, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"
"IVP0000275", "11/30/99", "14:39:00", "109", "Scaler", "Alpha", 1.04E+01, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"
"IVP0000276", "11/30/99", "14:41:00", "109", "Scaler", "Alpha", 1.36E+01, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"
"IVP0000277", "11/30/99", "14:44:00", "109", "Scaler", "Alpha", 7.12E+00, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"
"IVP0000278", "11/30/99", "14:46:00", "109", "Scaler", "Alpha", 6.48E+00, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"
"IVP0000279", "11/30/99", "14:57:00", "109", "Scaler", "Alpha", 2.36E+01, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"
"IVP0000281", "11/30/99", "15:00:00", "109", "Scaler", "Alpha", 6.69E+00, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"
"IVP0000282", "11/30/99", "15:21:00", "109", "Scaler", "Alpha", 1.32E+01, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"
"IVP0000283", "11/30/99", "15:25:00", "109", "Scaler", "Alpha", 1.40E+01, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"
"IVP0000284", "11/30/99", "15:27:00", "109", "Scaler", "Alpha", 1.06E+01, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"
"IVP0000285", "11/30/99", "15:31:00", "109", "Scaler", "Alpha", 9.77E+00, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"
"IVP0000286", "11/30/99", "15:33:00", "109", "Scaler", "Alpha", 9.81E+00, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"
"RESP/CHECK", "11/30/99", "15:37:00", "109", "Scaler", "Alpha", 1.49E+03, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"
"RESP/CHECK", "11/30/99", "15:39:00", "109", "Scaler", "Alpha", 1.43E+03, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"
"RESP/CHECK", "11/30/99", "15:41:00", "109", "Scaler", "Alpha", 1.49E+03, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"
"BACKGROUND", "11/30/99", "15:43:00", "109", "Scaler", "Alpha", 2.14E+01, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"
"BACKGROUND", "11/30/99", "15:47:00", "109", "Scaler", "Alpha", 1.42E+01, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"
"BACKGROUND", "11/30/99", "15:49:00", "109", "Scaler", "Alpha", 1.45E+01, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"
"IVP0000287", "11/30/99", "15:58:00", "109", "Scaler", "Alpha", 6.88E+00, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"
"IVP0000288", "11/30/99", "16:03:00", "109", "Scaler", "Alpha", 7.00E+00, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"
"IVP0000289", "11/30/99", "16:13:00", "109", "Scaler", "Alpha", 1.69E+01, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"
"IVP0000290", "11/30/99", "16:16:00", "109", "Scaler", "Alpha", 3.47E+00, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"
"IVP0000291", "11/30/99", "16:21:00", "109", "Scaler", "Alpha", 1.70E+01, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"
"IVP0000292", "11/30/99", "16:24:00", "109", "Scaler", "Alpha", 2.39E+01, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"
"IVP0000293", "11/30/99", "16:28:00", "109", "Scaler", "Alpha", 2.05E+01, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"
"IVP0000294", "11/30/99", "16:38:00", "109", "Scaler", "Alpha", 7.11E+00, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"
"IVP0000295", "11/30/99", "16:40:00", "109", "Scaler", "Alpha", 1.73E+01, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"
"IVP0000296", "11/30/99", "16:45:00", "109", "Scaler", "Alpha", 2.39E+01, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"
"IVP0000297", "11/30/99", "16:48:00", "109", "Scaler", "Alpha", 1.38E+01, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"
"IVP0000298", "11/30/99", "16:52:00", "109", "Scaler", "Alpha", 1.70E+01, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"
"IVP0000299", "11/30/99", "16:56:00", "109", "Scaler", "Alpha", 1.38E+01, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"
"RESP/CHECK", "11/30/99", "17:00:00", "109", "Scaler", "Alpha", 1.38E+03, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"
"RESP/CHECK", "11/30/99", "17:02:00", "109", "Scaler", "Alpha", 1.35E+03, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"
"RESP/CHECK", "11/30/99", "17:06:00", "109", "Scaler", "Alpha", 1.41E+03, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"
"BACKGROUND", "11/30/99", "17:10:00", "109", "Scaler", "Alpha", 1.16E+01, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"

"BACKGROUND", "11/30/99", "17:11:00", "109", "Scaler", "Alpha", "1.15E+01", "Gross", "dpm/100cm2", "321,0,0.0, "dpm/100cm2", "Normal"
"BACKGROUND", "11/30/99", "17:15:00", "109", "Scaler", "Alpha", "1.50E+01", "Gross", "dpm/100cm2", "321,0,0.0, "dpm/100cm2", "Normal"

"Survey Location", "Log Date", "Log Time", "Probe S/N", "Log Mode", "Channel Type", "Reading", "Gross/Net", "Units", "E-600 S/N", "E-600 Address", "Stored Bkg", "Bkg Units", "Status"

"RESP/CHECK", "11/23/99", "10:32:00", "109", "Scaler", "Alpha", 1.54E+03, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"

"RESP/CHECK", "11/23/99", "10:34:00", "109", "Scaler", "Alpha", 1.46E+03, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"

"RESP/CHECK", "11/23/99", "10:35:00", "109", "Scaler", "Alpha", 1.49E+03, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"

"BACKGROUND", "11/23/99", "10:38:00", "109", "Scaler", "Alpha", 1.10E+01, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"

"BACKGROUND", "11/23/99", "10:39:00", "109", "Scaler", "Alpha", 1.42E+01, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"

"BACKGROUND", "11/23/99", "10:43:00", "109", "Scaler", "Alpha", 1.44E+01, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"

"IVP0000284", "11/23/99", "10:47:00", "109", "Scaler", "Alpha", 7.38E+00, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"

"IVP0000285", "11/23/99", "10:50:00", "109", "Scaler", "Alpha", 2.00E+01, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"

"IVP0000286", "11/23/99", "10:53:00", "109", "Scaler", "Alpha", 1.32E+01, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"

"IVP0000287", "11/23/99", "10:59:00", "109", "Scaler", "Alpha", 2.05E+01, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"

"IVP0000288", "11/23/99", "11:03:00", "109", "Scaler", "Alpha", 6.57E+00, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"

"IVP0000288", "11/23/99", "11:12:00", "109", "Scaler", "Alpha", 1.00E+01, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"

"IVP0000289", "11/23/99", "11:15:00", "109", "Scaler", "Alpha", 1.68E+01, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"

"IVP0000290", "11/23/99", "11:18:00", "109", "Scaler", "Alpha", 1.34E+01, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"

"IVP0000291", "11/23/99", "11:22:00", "109", "Scaler", "Alpha", 1.32E+01, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"

"IVP0000292", "11/23/99", "11:25:00", "109", "Scaler", "Alpha", 1.66E+01, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"

"IVP0000293", "11/23/99", "11:28:00", "109", "Scaler", "Alpha", 1.64E+01, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"

"IVP0000294", "11/23/99", "11:33:00", "109", "Scaler", "Alpha", 2.00E+01, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"

"IVP0000294", "11/23/99", "11:38:00", "109", "Scaler", "Alpha", 1.66E+01, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"

"RESP/CHECK", "11/23/99", "11:42:00", "109", "Scaler", "Alpha", 1.50E+03, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"

"RESP/CHECK", "11/23/99", "11:44:00", "109", "Scaler", "Alpha", 1.41E+03, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"

"RESP/CHECK", "11/23/99", "11:45:00", "109", "Scaler", "Alpha", 1.50E+03, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"

"BACKGROUND", "11/23/99", "11:48:00", "109", "Scaler", "Alpha", 4.28E+00, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"

"BACKGROUND", "11/23/99", "11:49:00", "109", "Scaler", "Alpha", 1.77E+01, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"

"BACKGROUND", "11/23/99", "11:51:00", "109", "Scaler", "Alpha", 1.08E+01, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"

"IVP0000295", "11/23/99", "11:55:00", "109", "Scaler", "Alpha", 2.03E+01, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"

"IVP0000296", "11/23/99", "11:58:00", "109", "Scaler", "Alpha", 6.17E+00, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"

"IVP0000297", "11/23/99", "12:03:00", "109", "Scaler", "Alpha", 9.92E+00, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"

"IVP0000298", "11/23/99", "12:09:00", "109", "Scaler", "Alpha", 1.32E+01, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"

"IVP0000299", "11/23/99", "12:13:00", "109", "Scaler", "Alpha", 1.69E+01, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"

"IVP0000299", "11/23/99", "12:15:00", "109", "Scaler", "Alpha", 1.00E+01, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"

"RESP/CHECK", "11/23/99", "12:19:00", "109", "Scaler", "Alpha", 1.53E+03, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"

"RESP/CHECK", "11/23/99", "12:21:00", "109", "Scaler", "Alpha", 1.37E+03, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"

"RESP/CHECK", "11/23/99", "12:23:00", "109", "Scaler", "Alpha", 1.41E+03, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"

"BACKGROUND", "11/23/99", "12:25:00", "109", "Scaler", "Alpha", 1.79E+01, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"

"BACKGROUND", "11/23/99", "12:26:00", "109", "Scaler", "Alpha", 1.80E+01, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"

"BACKGROUND", "11/23/99", "12:28:00", "109", "Scaler", "Alpha", 1.46E+01, "Gross", "dpm/100cm2", 321,0,0.0, "dpm/100cm2", "Normal"

Appendix I

Sign Test

Sign Test, Surface Media Sample Data, Main Building, Survey Unit 779-35

Null Hypothesis:

H_0 : The mean (median) total transuranic surface contamination on or beneath the surface is greater than the $DCGL_w$.

Alternate Hypothesis:

H_a : The mean (median) total transuranic surface contamination on or beneath the surface is less than the $DCGL_w$.

$DCGL_w = 100 \text{ dpm}/100 \text{ cm}^2$

$\text{Alpha} = 0.05$

(1) (2)	X_i	D_i
Survey Results		
	(dpm/100 cm ²)	($DCGL_w - X_i$)
	14.49	85.51
	134.13	-34.13
	3.56	96.44
	19.64	80.36
	6.58	93.42
	1.02	98.98
	1.87	98.13
	3.16	96.84
	3.22	96.78
	1.53	98.47
	0.75	99.25
	2.00	98.00
	1.00	99.00
	1.37	98.63
	2.07	97.93
	1.37	98.63
	1.12	98.88
	1.07	98.93
	1.43	98.57
	1.07	98.93
	1.39	98.61
	1.51	98.49
	1.21	98.79
	1.66	98.34

(3) No value equals zero. Therefore, $n = 24$

(4) Number of positive differences = $23 = S+$

(5) Compare $S+$ to the critical value, k (from Table I.3 in MARSSIM)

$k = 15$
 $S+ > k$

Conclusion:

Reject the null hypothesis. Accept the alternative hypothesis that the mean (median) surface contamination on or beneath the surface is less than the $DCGL_w$.

480/480